approach

JUNE 1965 THE NAVAL AVIATION SAFETY REVIEW

V.10 #12

DETROIT PUBLIC LIBRARY

JUL 15 1965

TECHNOLOGY & SCIENCE

Trends in high personnel turnovers, reduced experience levels and rising accident costs justify maximum emphasis on maintenance training. Here, an experienced hand outlines a program which pays off . . .

IN THE

By LCDR H. H. Williamson, Jr., AEWPac

Agreement on the general desirability of a maintenance department training program is easily obtained, but disagreement mounts in direct proportion to the amount of discussion on what, when, how, by whom, and amount. Many general guidelines are available, but specific requirements are difficult for higher commands to establish because of the varied missions, sizes, and environments of subordinate commands.

Why should much effort be devoted to a training program for maintenance personnel in operating units? The emphasis and pressure are on today's aircraft availability and tomorrow's operational commitments. Results would not be evident for months, and even then there are no set measurements of effectiveness. Establishing a training program is difficult and time-consuming. Training requirements for operating units are vague, and everything from basic indoctrination through technical categories to requirements for a Ph.D. degree are covered in schools which have qualified instructors, adequate facilities, a proper environment and the sole mission of training.

Pilot training is stressed in operating units because exceptionally capable pilots are necessary to accomplish the vital missions they must be ready to perform with today's highly complex and costly aircraft. To achieve this capability, pilots are ordered to their squadron via a Replacement Air Wing or equivalent for qualification in the squadron's model of aircraft. Upon reporting to the squadron, although

"Their lack of practice makes them unsul;

HELONG RUN

qualified, higher commands require that pilots complete a regular, continuing and extensive training syllabus followed by periodic checks and requalifications.

Maintenance personnel usually receive RAW training enroute to an operating unit, but specific, standardized training requirements end there (with the exception of advancement in rating). Maintenance personnel are distributed equally in numbers and by rate and rating to squadrons or units operating the same model of aircraft, yet maintenance safety records, aircraft availability, and many other tangibles of these units vary to an incredible degree. Above or below average maintenance departments tend to be above or below average in nearly all respects and to stay that way for years. When changes occur, they are usually the result of corresponding changes in the department indoctrination and training program. Again considering the possible vital missions, complexity, and cost of today's aircraft, plus the improvements in the maintenance of them possible through a well planned and administered training program, shouldn't the same approach to training at the unit level be used for maintenance personnel as for pilots?

The training program advocated below requires research and administrative effort to establish, but it provides a solid base for a sturdy and proficient maintenance organization with high esprit de corps.

What Are the Objectives?

The objectives of a training program are to attain

n uns ul; Their lack of skill, timid."—*Thucydides*

and maintain maximum unit battle and operational efficiency; provide qualified understudies for key men; improve each man's performance by increasing his knowledge and skills; indoctrinating new men and qualifying them for responsible billets; qualifying men for promotion, and improving the standing of all hands in basic (A-N) requirements.

How Vital are Responsibilities?

The future effectiveness of the naval service is directly proportional to current efficiency in the development of qualified men. The vigorous prosecution of a well planned, effective, and continuous training program is one of the primary duties of those in authority. The officer or petty officer who fails to put forth his utmost efforts toward achieving satisfactory goals in training is failing a basic leadership requirement. No opportunity pointing toward the advancement of mental and technical growth or the development of skills essential to the proper functioning of the department should be overlooked.

Training is one of each commissioned and petty officer's most important responsibilities. Their performance in training should be reflected on fitness reports and evaluation sheets. Petty officers must train their own replacements, and they must be qualified and used as instructors.

2

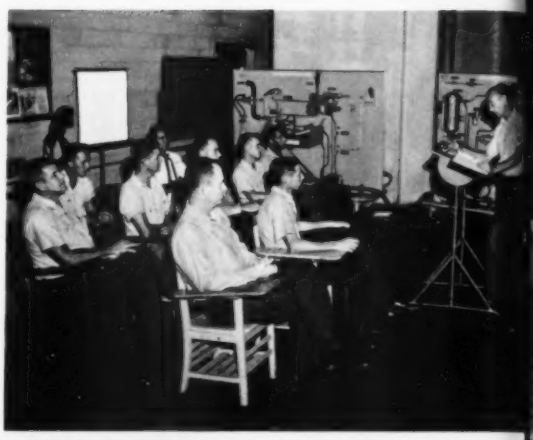
Although the support of his superiors is necessary in both spirit and action, each division officer is directly responsible for the training of his division. Just as a navigator must determine his present coordinates and plot a course to reach the desired ones, check his location regularly and record his progress, so must the division officer with his training program. He must know his division's training needs and design his training program to meet them. He must qualify his men for advancement in rate, but recommend them only when they have demonstrated the necessary personal integrity, sense of duty, leadership ability, technical knowledge, and initiative.

Organizing the Program

The training program can be divided into nine categories:

Required reading
On-the-job training
Military lectures and training films
Professional lectures and training films
Moral leadership discussions
Schools
Correspondence Courses
Military and professional practical factors
Periodic meetings.

To establish goals and facilitate administration, syllabi are necessary for the first five categories.

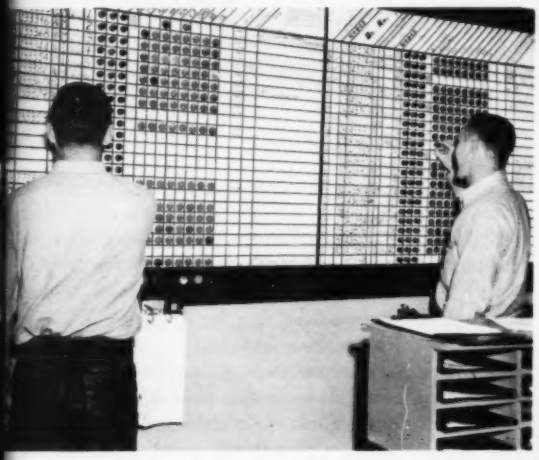


Why not use the same approach for training maintenance people as for pilots?

Use School

Operating units are primarily interested in short, class "C" courses. These, to cover nearly any need, are available through the Naval Air Technical Training Command, Replacement Air Wings, Naval Maintenance Trainers, Fleet Airborne Electronics Training Units, O & Rs, and the Fleet Training Groups. These units publish lists of courses with convening dates, outlines, lengths, eligibility and necessary security clearance in catalogs and notices. Procedures for obtaining quotas and TAD orders may be found in these catalogs and in the 1500 series of BuPers directives. Each month, desired numbers of graduates of various courses should be projected for

Petty officers must train their own replacements. . .



Provide a solid base for a proficient maintenance organization with high esprit de corps. . .

Testimonial

"VF/VA-44 used this system the last two years of my tour. Results:

- Highest percentage of advancement
- Higher aircraft availability
- Higher utilization
- Higher morale
- Higher re-enlistment rate
- Highest Airlant E totals
- Airlant weapons meet representative
- Lower man-hours per flight hour
- Lower daily working hours

Once the CO and Ops got behind the program, it worked." —*LCDR D. Bishop*

Provide qualified understudies for key men. . .

several months and compared with those graduates aboard and their transfer dates.

New personnel should immediately attend the specialized schools for the unit's model aircraft and equipment to get maximum benefit from the schools and before loss of the men would be felt. After attending these schools, new men should complete all required reading and then be assigned to work under supervision of the best qualified men for on-the-job training.

Organizing OJT

On-the-job training is the most important part of division level training. It consists of demonstrations and the learning and practice of skills under close supervision while at work or on-the-job. A Division OJT Training & Qualifications Status Board which reflects each man's qualifications and progress will serve both as a stimulus to the men and as a ready reference for work assignment. All work should be assigned with the secondary purpose of OJT. Personnel should be rotated in billets, when practical, to further their OJT qualifications.

The OJT syllabus should start with routine and regular division tasks and go on through those less routine which require a higher level of technical ability. Handbooks of Inspection Requirements, Maintenance Requirement Cards, NavPers 760, and Chapter 3 of BuWeps Inst. 4700.2 are useful in estab-

Testimonial

As commanding officer of two squadrons CDR W. H. Hile used this program successfully on both occasions. He states:

"A successful program such as this is the key to precise operations and mission accomplishment. It must be honestly and wholeheartedly supported by the strength and leadership of the commanding officer. In this day and age of the short turnover, most commanding officers are reluctant to undertake a program which will initially adversely affect their careers and possibly result in a great deal of head-knocking.

"In the initial stages of establishment, the time to set up and kick off the training program must be purchased at the expense of some operations. Thus, the CO becomes unpopular because he refuses to accept extra tasks or assignments which do not contribute but disrupt the squadron's readiness training program.

"Once this program is established and kept in force it actually reduces time required to accomplish extensive operations which opens the doors to increased performance. The ultimate result is a squadron that only works five days during the week ashore, accomplishing the same tasks that require a seven-day effort on the part of its neighbors. The program in itself is a morale booster cutting the time to implement it significantly.

"Great satisfaction comes from contributing to a unit that deploys, performs all assigned missions, then returns months later *with all of its personnel and all of its aircraft.* This is perhaps the best testimonial of the training program's effectiveness."

Improve each man's performance by increasing his knowledge and skills. . . .

lishing this syllabus. A qualification check-off list should be prepared for each item on the syllabus. It should include, as applicable, required reading, lectures, safety precautions, references, demonstrations, step-by-step procedures of the task, inspection-required points, and certification of a satisfactory knowledge and performance of the task by an authorized supervisor. All division personnel should be qualified in basic tasks. Each task and billet should have qualified alternates.

Use Required Reading

Required Reading provides a positive method of fulfilling the very important requirement that all hands "get the word" on pertinent and applicable information. RR items posted Monday should be read and the RR check-off form initialed by all personnel before securing Friday. These items should then be transferred to the Standing RR file.

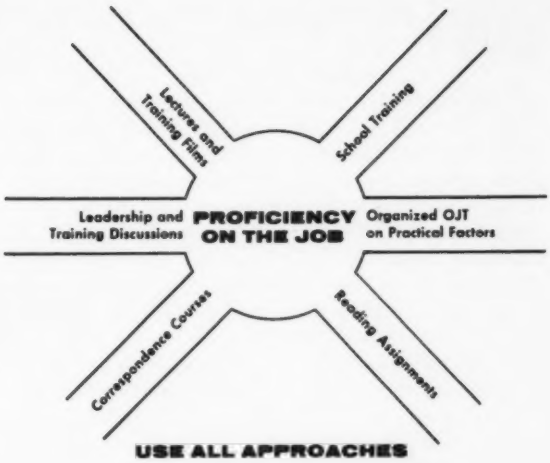
The RR syllabus can not include *all* pertinent and applicable information, yet it must contain all which is necessary for personnel to know in order to satisfactorily perform their duties. To lessen the burden and cover more material, only portions or excerpts of sources may be "Required," and these can be required by pay grade. Each item should be listed by title and number, if any, on both the syllabus and the read-and-initial form. The Standing RR file should be periodically reviewed for obsolete material.

The following should be screened for RR items: general and specific safety precautions, CAMIs, TIMIs, department-squadron-ship-station-type commander-BuWeps and OpNav instructions, model aircraft and equipment bulletins and changes, general bulletins and changes, items from BuWeps *"Aeronautical Material Reliability Digests,"* Naval Aviation Safety Center Maintenance *"Crossfeeds"* and "Weekly Summaries" of Aircraft Accidents, APPROACH magazines, HMI or MIM, Aircraft Cleaning and Corrosion Control Handbooks, and other handbooks and Military Specifications applicable to various ratings.

Use Military Lectures and Training Films

This syllabus should include local organization, policy, procedures, and regulations plus drills and

Indoctrinate new men—qualify them for responsible billets. . . .



topics which need to be reviewed periodically. It should be compared with the Moral Leadership Discussion syllabus to prevent *unintended* duplication, and it should complement military practical factors. This syllabus can be made applicable to all personnel in the unit, and can be divided by pay grade into two or three levels according to the size of the unit.

Use Professional Lectures and Training Films

This syllabus should include unit policy and procedures in technical areas, and should complement OJT and professional practical factors. Many basics will apply to all in the department. Beyond basics, the syllabus will vary with the division or branch and some branches will need a further breakdown by ratings and levels of maintenance.

Use Moral Leadership Discussions

This syllabus should be based on the Manual for Leadership Support, NavPers 15934A, supplemented by problems peculiar to the unit, its location, etc. Each discussion should have an appointed leader and aides who are familiar with NavPers 15934A and the references listed for each discussion.

Use Correspondence Courses

All men should procure and study Navy Training Courses required for their next advancement in rate, unless all of these have been completed as indicated by an entry in the individual's service record. Records should be kept on each man showing courses completed and progress on those being studied.

Monitor Military and Professional Practical Factors

A Record of Practical Factors, NavPers 760, should be issued each man below E-9. His progress should be checked weekly until he satisfactorily completes all practical factors for his next rate.

The individuals in the unit best qualified to determine satisfactory completion of each practical factor should be the only one authorized to initial that factor as having been completed. These men should be chosen from the command for military factors in order to get those best qualified, but will probably have to be from the department or division for the professional factors. They should be informed of their duty and why they were chosen, motivated to encourage and aid men in qualifying, cautioned to maintain high standards, and offered help in obtaining any necessary equipment and material.

A NavPers 760 with the individual's name who is authorized to initial each factor as having been satisfactorily completed typed beside it should be conspicuously posted in each division's spaces. Lectures, demonstrations, and testing periods may be scheduled to further assist men in completing their factors.

Select Instructors

Petty officers are best all-around qualified to train their own replacements, fulfill part of their military practical factors while doing so, and acquire additional stature in the department by instructing. Officers, NAESU engineers, contractor's technical representatives, safety engineers, fire chiefs, traffic policemen, and other experts should be used to add variety to and increase interest in the program.

Prepare Lesson Plans

Lesson plans should be assigned and prepared well in advance of their scheduled presentation. The standard format lists lecture number, title, objective, time required, date prepared, references, instructional aids, presentation, and summary. *The presentation should be well organized and so complete that a different instructor could use it with little preparation.* Lesson plans should be closely reviewed

and returned for additional preparation if not satisfactory.

Schedule Training

The minimum weekly formal training requirements for each man in the department should include two lectures or training films on professional subjects, a lecture or training film on a military subject, a moral leadership discussion, and required reading posted by the division officer. Sessions shouldn't normally exceed one-half hour, but may vary from half to twice this time depending upon both the time available for training and that needed for the particular session. Instructors must be prepared for the class in all respects at the scheduled training time.

Formal training can be easily scheduled in accordance with the weekly training requirements after syllabi are prepared. Training schedules must be accomplished assiduously. If necessary, the lecture may be presented twice with half the men at each.

Maintain Training Records

Training records are necessary to indicate progress toward goals established by syllabi, reflect overall training achievements, and facilitate intelligent planning. Each training attendance record, with comments on its effectiveness, should be submitted to the division officer immediately after each session. Training record entries should be made by only one man assigned by the division officer.

Division master training records should include the five syllabi listed above in "The Training Program" with progress charts or graphs on each, a copy of each lesson plan, a copy of each OJT check-off list, and a file of monthly training schedules and weekly training reports. Each syllabus should list lectures, training films, and the individual who prepared the lesson plan or will ordinarily give the lecture. A chart on graph paper, with the syllabus across the top and the names along the left margin, is an excellent means of rapidly determining both specifics and generalities on the progress of training. All these records may be kept in looseleaf binders.

Records on each individual should include the

You can always find time for training.

Division Officers Personnel Data Card (type commanders usually require use of a specific card), a Record of Practical Factors (NavPers 760), OJT qualification record, physical training qualification record, military lectures and training film attendance record, professional lectures and training film attendance record, and a Moral Leadership Discussion participation record.

Require Reports

Two reports should be submitted to the department head by each division officer: a monthly training schedule on the 20th of each month, and a weekly report of training each Monday morning listing all training completed the previous week.

Hold Meetings

Meetings can be classified as a form of leadership and management training through indoctrination in goals, participation in the choice of alternate courses of action, and evaluation of progress. They can be used to engender mutual respect, confidence, motivation and interest in problems.

Periodic meetings with all officers should be held by the department head, and with all second class and above by each division or branch officer. Meet-

About the Author

LCDR Williamson, an Aviation Maintenance LDO, developed this maintenance training program over a 17-year span. It evolved into its present form about seven years ago and has been used effectively in a variety of aviation maintenance activities including FASrons 102 and 103, VP-45, AirLant Combat Crew Training, Basic Training Command Class C Maintenance, VA-93 and AEW-BaronPac. In every case the unit achieved some of the highest marks ever for mission-readiness and at the same time maintained a high level of esprit de corps.

You cannot teach a man anything, you can only help him to find it with himself
Galileo

tings must not be held too often, and adequate preparation must precede each one.

Each man's interest in the department's status and all that concerns it must not be underestimated. All hands are interested in and should know all unclassified: future schedules, plans, events, and the state of readiness for them; trends on aircraft availability, repeat discrepancies, missed launches, aborted flights, safety record standing, number of discrepancies by aircraft system, percent of scheduled flight hours completed, and percent of readiness for deployments; percent of scheduled maintenance training completed, percent of personnel prepared for advancement in rate, and percent of personnel making rates or quota on past examinations; trends on routine maintenance practices such as discrepancy corrective action (any "ground checks O.K."?), FOD prevention, aircraft cleaning and corrosion control, proper completion of FURs, and observance of safety precautions; care, upkeep, and calibration of tools and equipment, economy in use of materials, and cleanliness of spaces; general response to drills and routine work, appearance of personnel, and military courtesy. The second and third groups should be graphed. Desired and undesired examples of items in the last three groups are more impressive than generalities.

Meetings are the ideal stage from which to expound the standards of leadership and performance of duties that are expected and demanded. These standards should be set higher than thought attainable: errors in judgment of the attainable are often distressingly low, and low estimates of subordinates' abilities are insulting. *High standards, by reaffirming dedication to the highest ideals and traditions of the Navy, furnish worthy challenges, induce a feeling of security, bolster self-confidence, and inspire the self-identification of each person with both the goals of the leader and with his responsibilities as a member of the group.*

Motivate

Each individual must realize the standards he can and must raise simply by knowing and performing his duties as an officer or petty officer. He must feel involved. He must feel burdened, but not oppressed. His emotions must be aroused and rechanneled. His thoughts, in short, must get off the mysteries of the Hawaiian Wiggler, whether of the fishing lure or hula variety, and on the problems at hand. The leader's reward will be the group's adoption of his goals, full assumption of their myriad responsibilities, interest and pride in *their* organization, and their remark, "I didn't think we could do it!" after stretching for and receiving the accolade of "Best in type."

References

Navy Regulations, Articles 0702A, 0704, 0709, 0710, 0712, 0714, 0740, 0803, 0903, 0907, 1044, 1210
BuWeps Instruction 4700.2
BuPers Instruction 1430.7
Division Officer's Guide
Bluejacket's Manual
General Order 21
U. S. Navy Safety Precautions, OpNav 34P1 (currently being revised)
Type Commander's Safety Precautions
Safety Index, OpNav Notice 5100 of 4 Nov 1964
U. S. Navy Film Catalog, NavWeps 10-1-77
Shipboard Training Manual, NavPers 90110
Manual for Navy Instructors, NavPers 16103
Manual for Leadership Support, NavPers 15934
Manual of Qualifications for Advancement in Rating, NavPers 18068
Manual of Navy Enlisted Classification, NavPers 15105
Training Publications for Advancement in Rating, NavPers 10052
List of training Manuals and Correspondence Courses, NavPers 10061
Use of Navy Training Courses, NavPers 10050

UNEXPECTED

TRUTH and
CONSEQUENCES

RUNWAY

He continued his approach oblivious of the red light glaring at him from the tower.

The eight-plane cross-country flight from MCAS Westcoast to Inland Air Force Base had not been a resounding success. Everyone made the trip, but not without their problems; one *Crusader* had landing gear difficulty and another had radio failure.

The pilot with the landing gear difficulty experienced a red warning light in the gear handle when the gear was down. Although the gear indicated DOWN and LOCKED and he had normal utility hydraulic pressure, he actuated the emergency air bottle as a precautionary measure prior to the uneventful landing. Air Force maintenance crews got to work on the bird and had it "repaired" by the next morning.

Maintenance crews also made an effort to correct the radio failure in the other F-8 but the unfamiliar integrated electronics package proved to be too much for them.

The flight leader called his squadron operations department back at Westcoast and discussed the situation of radio failure and landing gear problems. He was advised to return the two sick birds to Westcoast for repairs. He was to fly the aircraft that had the landing gear emergency and his wingman was to fly the bird with no radio.

The flight leader filed IFR for Westcoast and briefed his wingman. They discussed the possibility of diverting to NAS Delta in case of gear failure, with the no-radio aircraft landing first and the leader to follow him in and taking the morest.

Basic common knowledge of aircraft systems and the associated basic maintenance requirements should have told the flight leader that once the landing gear air bottle has been actuated, as it had, the bird must be grounded until the utility hydraulic system is bled, the hydraulic by-pass valve reset, and a satisfactory drop-check is performed. "Old Lead," with about 900 hours in type, launched in the bird anyway. He did not fly a test hop and chose to overlook a drop-check.

After takeoff from Inland Air Force Base, the flight leader immediately received an unsafe gear indication. He visually signaled his wingman to check his gear.

"I did so and let him know by hand signal that all his gear were down."

The leader then informed Departure Control that the flight was diverting to NAS Delta where the morest could be used.

As the flight continued on a southerly heading, rather than turning West, the wingman concluded that they were diverting to Delta as briefed. His suspicions were confirmed when the flight leader signaled him to switch to Delta's radio frequency.

As the flight neared Delta, the leader contacted the tower, who informed him that the field was closed. When asked if this was due to runway conditions, the tower came back:

"Roger, I have a thousand vehicles on the airport which are uncontrolled due to the National Model Meet."

The tower recommended a divert to Cactus Air Force Base—a short distance away. Although he had never been there and wasn't prepared for this turn, the flight leader agreed.

The wingman was on the Delta tower frequency and was aware that the flight was near Delta, but, since he had never been in the area before, he didn't recognize anything.

"We dumped fuel and let down from our 7500-foot cruising altitude to 3000 feet. Both aircraft raised wings and prepared for landing," the wingman recalled.

The flight leader had tuned to the Cactus tower frequency, but didn't signal his wingman as to the change. The flight was cleared to land at Cactus on runway 17.

With the tacan holding Cactus about 200 degrees, the flight leader saw a field and spotted runway 17. He set his wingman up for a straight-in approach to the runway and passed him the lead.

"I took the lead and began my descent," the wingman noted.

The flight leader then called the Cactus tower for a gear check and asked them to give his radioless wingman a green light.

The Cactus tower, not having the flight in sight, determined that the flight was at a nearby civilian field—in line with the approved course to Cactus. They called the flight leader informing him that he was at the wrong field. They also called the civilian tower and told them to give the approaching *Crusader* a red light.

The aircraft came to rest 550 feet beyond the end of the runway.

The wingman, still thinking he was cleared to land at NAS Delta continued his approach oblivious of the red light glaring at him from the tower. It was too late for the leader to wave him off.

The wingman touched down on what he thought would be the 8000-foot runway at Delta—actually the 5200-foot civilian runway.

"I landed close to the approach end of the runway and rolled out using maximum aerodynamic braking. There were no distance markers that I could see, so I began mild braking at 110 knots. I had not been on the runway long enough to think that I might need harder braking at this time. When it became evident to me that I was going to run off the end, I braked harder and went off the end at what I estimate to be 30 to 40 knots, dropped off a 40-foot cliff and stopped."

The aircraft came to rest 550 feet beyond the end of the runway. The airport manager was the first to tell the bewildered wingman where he was.

"Lead" circled the field long enough to see what became of the wingman.

"I started a port turn to try and see what happened and saw the dust cloud come up where (BuNo) went off the end."

He then called the Cactus tower, told them what had happened and proceeded there and landed—uneventfully.

Truly a situation created by errors spawned from a combination of malfunctions, misjudgments and unprofessional techniques.

First, both pilots violated some simple procedures that are second nature to most aviators. The flight leader's acceptance of the aircraft with the faulty landing gear without a suitable test hop and drop check shows some questionable judgment, not to mention an unusual confidence in a ground crew that was unfamiliar with the F-8.

Second, proceeding to a strange field without referring to the NOTAMs prior to flight shows a certain unprofessional manner as does intending to land at a strange field without a quick overhead pass for a "look see."

Third, perhaps the simplest and most basic procedure of all turned out to be the most devastating when violated: Always check the tower for a green light when landing without a radio!

Finally, the accident illustrated the point that flight without a functioning radio, whether alone or escorted, is at best an emergency situation, and should be avoided if at all possible.

FREE RIDE

While on a two-plane bombing flight, an A-4E experienced vibration followed by a flameout.

At this time, the pilot called a May Day and turned back toward the ship which was about 12 miles away. He got a relight which was followed by three successive flameouts and unsustained relights. When the fifth flameout occurred at 1600 feet, the pilot decided to eject. (The NATOPS manual recommends a minimum ejection altitude of 5000 ft AGL although in this case the aircraft accident board thought the pilot was justified.)

"I slowed the plane to 200 knots, still at 1600 feet," the pilot states. "I placed my left hand on the curtain, trimmed the aircraft, reached up with my right hand, placed my feet on the rudders, positioned my body and ejected."

"The ejection was normal in all respects. As I was floating down, I released my left lap rocket jet fitting and connected the life raft lanyard to my torso harness. I removed my oxygen mask and waited to hit the water. I saw the plane in a left-wing-down attitude just before it hit the water.

"Upon entry into the water, I attempted to release the shoulder rocket jet fittings but couldn't because of slippery gloves. I reached down and pulled the right toggle of my Mk-3C which functioned properly. (*Current procedure is to inflate the Mk-3C during parachute descent.—Ed.*) As I came to the surface, I was being towed by my chute face down at a rapid rate. The surface winds were *quite* strong and the seas heavy. It was very difficult to breathe. I tried pulling on the risers to deflate or spill the chute but could not because of the tension on them. I decided to roll over on my back and did so without any difficulty. Then it was much easier to breathe.

"I took off my right glove and tried to release the rocket jet fittings but with no success. By this time, I was being towed at a great rate of speed. With both hands, I pulled on the two starboard risers and managed to take enough tension off the starboard fitting to release it—clamping the risers with the left hand and releasing the rocket jet fitting with the right.

"I started the same procedure on the left rocket jet fitting when a helicopter came over. He must have partially deflated my chute because I felt a sudden relaxing of tension on the port risers, but before I could get to the rocket jet fitting, the tension was there again and I couldn't release it. I again reached with both hands and tried to take the tension off of the fitting by pulling on the risers. This was very difficult because I was tiring rapidly. The helicopter then came around again and deflated my chute, and I released the left fitting without any difficulty."

The investigating flight surgeon stated, "It is worthy of special emphasis that had it not been for the intervention of the helicopter, the pilot probably would have drowned because of his inability to release his 'quick-disconnect' fitting."

"The helo then lowered the horseshoe collar," the pilot continues, "and I slipped into it with no trouble. I was hoisted into the helo and returned to the carrier, exhausted and wet, but glad that all survival and ejection systems had operated as advertised.

"In retrospect, I think that I would have had an easier time in the water if I had left my mask on because initial breathing while being towed face-first in the heavy seas was extremely difficult. I also recommend removing gloves prior to entering water. After the gloves were wet, they were too slick to allow me to operate the rocket jet fittings. The fittings with pressure on the risers were impossible to open."

(*Several squadrons are currently evaluating for BuWeps a fire-resistant polyamide fabric and leather flying glove. Initial evaluation reports are highly favorable.—Ed.*)

Among the aircraft accident board's recommendations was that required materials to incorporate Clothing and Survival Equipment Change 5, Rev. A (parachute canopy deflation pockets) be made available on a priority basis for all fleet aircraft.

The fourth endorser to the accident report recommended consideration be given to prompt procurement and issue of the newly evaluated (Koch) fittings for all aircraft squadrons.*

*As of this writing, the Aviation Supply Office is initiating procurement action for deliveries May through August of approximately 7,200 adaptors and 4,300 canopy releases for Koch fitting installation. A second contract is scheduled to be awarded in July. No break in delivery of the equipment is expected and all action is to be taken to monitor the program.

The Most Unforgettable Safet

I've been in many squadrons and I've seen many Aviation Safety Officers, but the one I remember best is Barcus. That isn't his real name, of course. Not that he's too modest for me to mention his name, to the contrary he'd gather up all the copies of this story for himself if his name was in it. Maybe that is what makes him so unforgettable. If there was any one characteristic that stood out about Barcus it's his brashness. And rather than be a hindrance, he used this to a great advantage in his safety programs.

Now that is not really the truth, because Barcus didn't have a "program." At least it didn't appear that he did. Everything just seemed to happen, and just seemed to happen for safety. I realize that this probably took a lot of behind-the-scenes planning, but outwardly there was only the appearance of spontaneity.

Of course, Barcus used all of the gimmicks—the copy of APPROACH on a string in the head, the *Safety Posters* over the drinking fountain, and he even moved the photo of the Old Man in order to install a "Safety Board" with pockets for *Crossfeed, FAA Notes, Engine Summaries* and such other publication as the Coast Guard *Rescue Bulletins* and occasionally even the *U. S. Army Aviation Digest.* These were read, too. Not just as time would permit on a rainy read-and-initial-day but on a regular basis. Oral or written questions tossed in during the morning All Pilots' Meeting could easily disclose whether or not you had been through the safety file. Even at those APMs where the subject was other than Safety, you could count on Barcus getting in at least one word on the subject.

As I said before, the one trait you would notice first was Barcus' brashness, but the thing you would remember the longest was his thoroughness. He was successful in baiting pilots more senior in rank and more experienced in flight hours than he by the

Officer I've Ever Known

By CDR D. M. Layton

simple method of knowing the book. I'll swear that he could almost recite the Flight Manual—not only by what the paragraphs said, but by what they meant and by what relationship they had to other parts of the book. Even the Maintenance pubs fell under his perusal pattern. He didn't do this to show off—he just wanted to know the most about the aircraft that he was flying.

It didn't take a new pilot long to realize that Barcus spoke as an expert. When he asked a simple question that had a simple answer—which no one knew, there was a great scurrying around for handbooks before the next day's APM. There never was any question about giving Barcus a collateral job. He was so busy being ASO that there wasn't any time left for anything else. Of course, he was the Officer-in-Charge of the Squadron Beer Musters, but that never interfered with his other duties.

A Gung Ho Safety Officer can do his job of getting everyone thinking about safety so much that they never fly, the planes sit on the ground, and the accident rate goes to zero. Not so with Barcus. There were no pussycats in that squadron—every man was a tiger. And Barcus was King of the Beasts. He could, and would, turn his plane every way but loose. He could push it, should the occasion demand, right to the edge of the envelope. But the thing that made his flying great was that he knew exactly where the envelope boundary was. And by exactly I mean precisely. Not some rough figures based on approximate weights and WWII Standard Days. He didn't trust his memory for this either, despite the fact that it was phenomenal. Preflight computations, in-flight determinations and above all check lists were part of his flight equipment the same as his flight suit and helmet.

Barcus had his desk in Ops, but this was just a place to hang his hat. His beat included Ops, Maintenance, the Hangar, Flight Line and even into Supply. If he saw an unsafe practice it was resolved on the spot and not by a memo to the XO or Skipper. A check crew on a work stand without guard rails were instructed to stop work and install the rails—then the Maintenance Officer was informed of the problem.

What made Barcus such a good ASO? It really wasn't his brashness nor his knowledge. It was his teaching by example and his development of self-motivation in others. He demonstrated to all hands that you could fly the aircraft and complete the mission in a safe manner better than you could in a half-safe way. Soon we were trying to out-do and out-think him and before we realized what we were doing we were thoroughly learning our machine and our techniques.

Yes, I recall a lot of Safety Officers, but as they used to say on that TV show, most of all, I remember Barcus.

BREAD and BUTTER

By MAJ R. A. Bonney, USMC, NASC

Ideas, ideas, ideas! Everyone has an idea. During my first few months in the aircraft accident prevention business I was very much impressed. Everywhere I went, someone had a new idea that would prevent accidents. With all this help the job appeared to be a breeze.

But in a very short time the good impression turned to bewilderment and dismay. I was bewildered because it was impossible to personally accomplish everything that was suggested. It just wasn't possible for me to do all the research that was necessary to develop the mere germ of an idea into a clear, concise, objective proposal or recommendation.

Gradually an apparent solution presented itself. I started a campaign. Every time someone said, "Why don't you?" my reply was, "That's a great idea. Just write it up and justify it. I'm sure we can use it."

The results of this campaign? It accomplished a definite decrease in the "Why don't you's?" In fact they stopped—and so did every other form of constructive suggestion. I had progressed from one frustration to another. From a staggering number of suggestions to none at all.

Was there a reason for this switch from feast to famine?

I prefer not to think it laziness on the part of the suggestors. I think the idea of writing put the damper on. An idea tossed out over a cup of coffee at the snack bar is direct communication. Obscure points are "thrashed out" face to face.

By contrast, writing is difficult. Any individual who has done any military writing has had the disheartening experience of having his work changed time and again by every echelon in the chain of command. Why should he voluntarily subject himself to this? Why not turn the idea over to someone else?

This is what happened to me. People saw in me an opportunity to get their ideas sold quickly and painlessly. Unfortunately, no idea gets sold quickly and painlessly.

A cursory look at history is enough to convince anyone that most truly great ideas came to fruition through the efforts of men who were highly individualistic and had exceptionally strong conviction with respect to their particular ideas.

Now the notables in history were seldom entirely right in their concepts. In fact, many seemingly startling discoveries were later found to be incorrect. But these discoveries did stimulate the imagination of others and progress was made. Similarly, no one, the author of an idea, or the individual who screens it, can expect that any concept will be entirely correct. They cannot expect that it will be the panacea for whatever wrong it intends to correct.

What is a good idea? Before I try to answer that, let's determine what kind of ideas we are talking about—there are some distinct species.

One type of idea involves an "invention," such as "Why don't you invent something which will eliminate overboosting?"

Another type is an adaptation of existing equipment: "Why not put a coffee pot in the A-4 for long range missions?"

A third idea concerns a change. For example, "Why don't you use steel bolts in the landing gear instead of aluminum?"

Each of these ideas is easy enough to discuss in conversation. When it comes to filling up a blank sheet of paper with your own words it is not so easy. How much do you really know about your idea?

If it solves one problem does it create another?

Does it complicate construction, supply, installation, and maintenance?

Is the effort required to implement your idea compatible with the urgency of the problem?

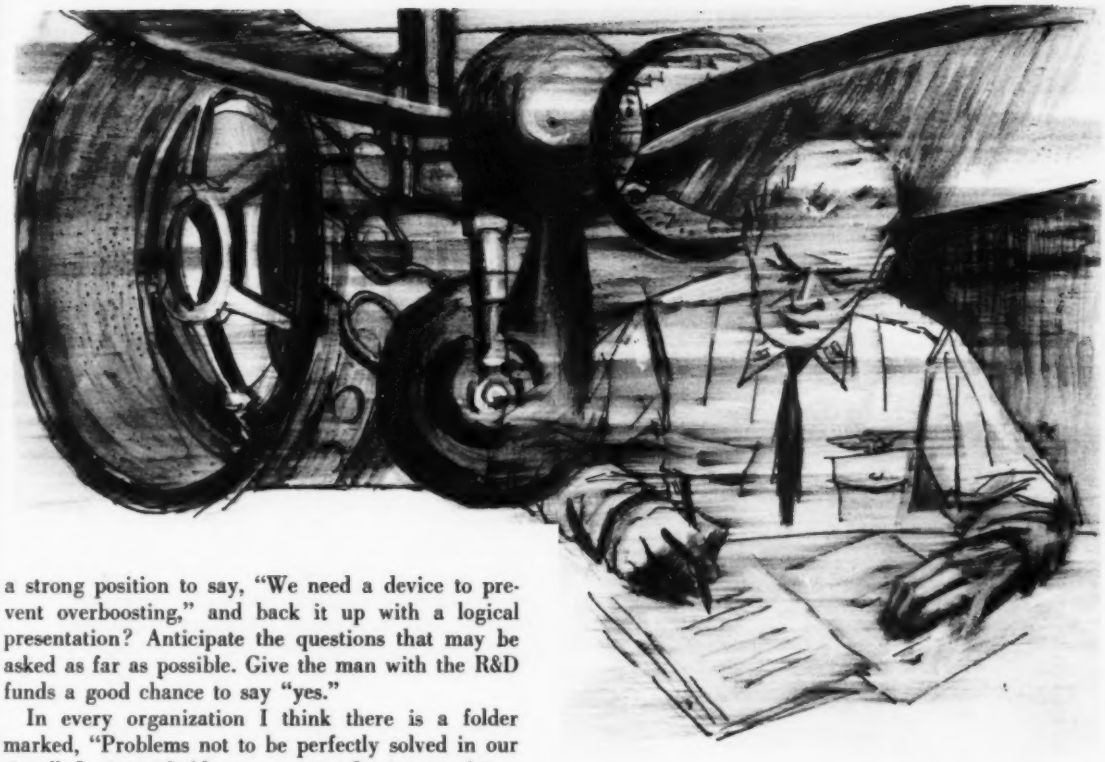
What is the background of the situation your idea proposes to aid? Is it a "recognized" problem or one that has just appeared?

After mulling over some of the circumstances, sooner or later you have to answer the question, "Is it practical?"

In effect what you are doing for yourself is making a small "staff study." Use the basic headings as a guide: Situation; Problem; Assumptions; Facts bearing on the problem; Discussion; Conclusions; Recommendations.

By the time you have done some work along these lines you will be in a much better position to judge whether or not you have a good idea. And if it passes the test you may be able to float it through channels with less damage from the shoals, whirlpools and mudbanks that line the route.

Perhaps you are not an inventor. Maybe you don't need to be. After examining the problem are you in



a strong position to say, "We need a device to prevent overboosting," and back it up with a logical presentation? Anticipate the questions that may be asked as far as possible. Give the man with the R&D funds a good chance to say "yes."

In every organization I think there is a folder marked, "Problems not to be perfectly solved in our time." It is probably top secret. In it are things like "inadvertent wheel-up landings," "release of wrong ordnance," and "loss of canopies on takeoff." If your idea touches areas like these it has to recognize what has gone on before (and failed to solve the problem) and be a significantly better mousetrap, at least if it is to get the attention it deserves.

By now you may be thinking, "Does this guy *want* ideas?" Positively "Yes!" There is always a need for ideas. And they need not be in the pure accident "prevention" area. Some years back a pilot commented on the lack of eating facilities for the transient wearing a flight suit. A survey showed he was essentially correct and a "hot food" compaign produced enough action to reduce the problem.

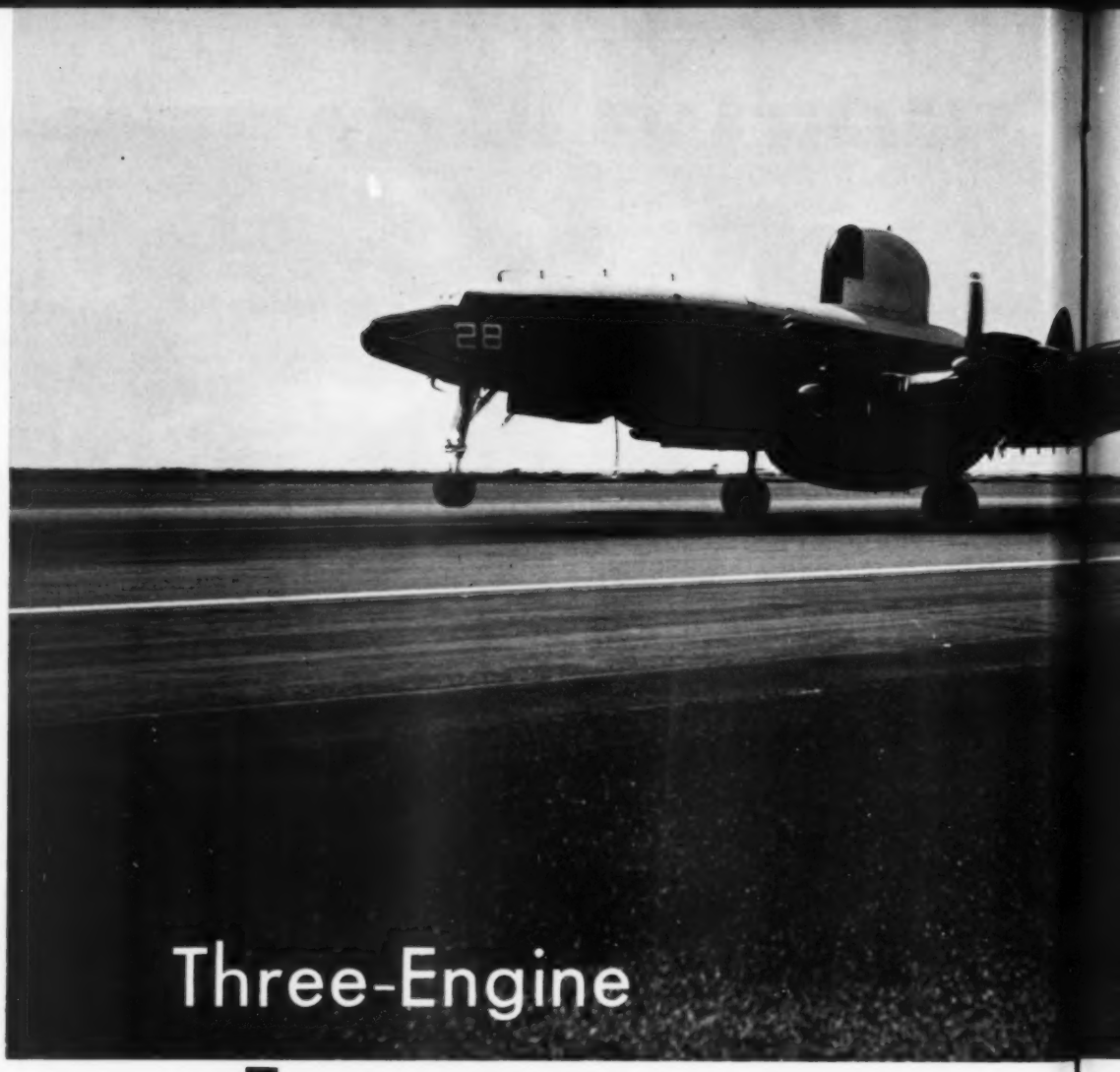
While accidents are unfortunate, they do produce ideas. In some accidents black light has been used to study cockpit instruments in efforts to determine reading and setting of the needles at the moment of impact. Following one crash it was proposed (by the accident board) that the backs of instrument needles be coated with a paint reactive to ultraviolet light.

What *will* happen to this idea? Think of all that will have to be done to translate it into reality. Therefore is it a good idea or a bad idea? In truth no idea is entirely good or bad. Even poor ideas are often useful because they trigger a new and better path to progress and improvement.

Individuals have the option of presenting ideas to the various safety organizations directly. Of course, circumstances might be such that you would be obligated to expose your correspondence to the mercies of the chain of command. Look on the bright side—you might gain some friends for your idea.

If the originator has an obligation to have his idea reviewed, the reviewer also has an obligation. Don't give the guy with the idea a bad time. He probably won't come back and, seeing what happened to him, you probably won't hear from his friends either. So, if your name is on the envelope or route sheet, be alert to see that all ideas are considered.

In the final analysis, it is accident prevention which preserves our equipment and helps keep a unit combat ready. To this end, no matter how you slice it, ideas are the bread and butter to any accident prevention program.



Three-Engine Emergency Rate of Climb... Positive or Negative?

BMEP 150."

A pause. Then. . .

"BMEP 150 set, ready for takeoff, sir!"

"Max power."

As the brakes are released, the 70-ton EC-121K begins its takeoff roll. In the cockpit the pilot's right hand pauses momentarily to punch the elapsed time clock and then moves on to the throttle quadrant. When the sweep hand passes 12 the second time, the *Willie Victor* will have completed, successfully, or otherwise, the most

By LCDR Glenn M. Hayden
AEW Barrier Squadron Pacific

critical phase of a normal flight . . . *the takeoff*.

"Max Power Set" calls the flight engineer. Speed is building up rapidly now . . . "50 knots." The pilot moves the rudder pedals cautiously, testing for rudder control. . . feeling it he gets off the nosewheel steering, grasps the yoke with his left hand and calls out, "I have the yoke."

The 6000-foot marker passes . . . IAS checks.

The 4000-foot marker passes . . . again IAS checks.

Refusal speed of 115 knots is coming up now and the pilot moves his right hand from the throttles to the yoke. Three or four more seconds pass then he starts rotating the nose for lift-off.

"*Loss of power on Number two . . . Number two engine has auto feathered, Sir!*" The services of one engine have been completely lost. What now? The aircraft is past refusal . . . a 70-ton mass hurtling towards the end of the runway at 200 feet-per-second.

The decisions made and actions taken by the pilot in the next few seconds can mean life or death for the crew. There is not time to ponder—little margin for error.

If the takeoff is being attempted under *normal conditions*, there is no question as to the proper course of action. NATOPS clearly states that "The takeoff should be continued and the aircraft flown out on three engines if the emergency develops after the refusal speed is reached."

The reason behind this statement is sound. If the pilot should reject takeoff at or above refusal speed, he increases the possibility of not being able to stop the aircraft on the remaining runway. Going off the end could mean injury or death to crewmembers and damage to the aircraft.

Unfortunately, conditions in our example are *far from normal*. The aircraft has an extremely heavy fuel load for a 15-hour mission. Preflight computations, based on existing temperatures and humidity, indicate that the engines can be expected to develop only 93% of maximum rated power.

The question then is not should the aircraft be flown off in compliance with NATOPS procedures, but can it be flown off?

Let's see if Section XI of the C-121 NATOPS contains the solution.

A quick survey of the charts indicates there are two possible ways to arrive at the answer. The "Three-Engine Operation: Takeoff Weight Limited by Zero Rate of Climb" chart (Figure II-38) seems to provide the easiest path to the solution. We enter this chart with inboard BMEP and density altitude and come out with the maximum gross weight at which a zero rate of climb can be maintained on three engines. If the aircraft gross weight on takeoff exceeds the maximum computed weight, then the aircraft will have a negative three-engine rate of climb.

Let's suppose the pilot in our example *is* faced with a negative three-engine rate of climb. He has two possible courses of action open to him.

He may continue the takeoff roll and attempt to get airborne, raising the gear and/or dumping fuel so that a positive three-engine rate of climb may be achieved. While in this transitional stage he must fly the aircraft so as to take maximum advantage of ground effect.

The other option is to reject takeoff, accepting the possibility that the aircraft may run off the runway . . . if this appears to be the lesser of the two evils.

This is a difficult decision, and to make it properly, the pilot should have the best information avail-

able. The Limiting Takeoff Weight Chart (Figure II-38) discussed above is a step in the right direction but it may not provide enough information to satisfy the pilot's preflight planning requirements. For instance, it doesn't help him determine rate of climb in feet per minute or tell him whether rate of climb will be positive or negative with a *different* aircraft configuration.

We must go to another chart for more information. This one, "Three-Engine Operation, Emergency Rates of Climb" (Figures II-54), is a family of four graphs representing four possible aircraft configurations. After selecting the graph with the appropriate aircraft configuration (gear down and flaps 60% in this case), we enter it with density altitude and gross weight to determine rate of climb (positive or negative) in feet per minute and the best CAS for three-engine climb.

This chart (Figures 11-54) can be extremely useful providing it is properly used. One should keep in mind however that the specified conditions of maximum power, zero humidity and standard day are rarely encountered in normal operations. Variations in temperature and humidity can affect maxmum power available and *unless sound correction* is applied to the read out of this chart, it *should not* be relied upon. For example, a rate of climb computed to be a positive 50 fpm using standard day conditions may change to a negative 50 fpm when the chart read out is corrected to reflect existing temperatures and humidity on a hot summer day . . . a variation that could spell the difference between an emergency safely handled or a fatal crash.

To correct the "Emergency Rates of Climb" chart (Figure II-54), turn to the appropriate "Emergency Rates of Climb, Effects of Power Deviation" chart (Figure II-55). Before entering this chart first compute maximum horsepower available per engine under anticipated takeoff conditions. Computing maximum Brake Mean Effective Pressure (BMEP) is a preliminary step to obtaining maximum Brake Horsepower (BHP). Then. . .

$$\frac{\text{BMEP} \times \text{RPM}}{236} = \text{BHP}$$

If, for example, the maximum predicted BMEP is 265, then . . .

$$\frac{265 \times 2900}{236} = 3256 \text{ BHP}$$

(Predicted)

Subtract the predicted BHP from the maximum allowable horsepower for the engine to obtain the difference in BHP. For example, if maximum horsepower allowable BHP is 3400, then . . .

3400 — 3256 = 144 BHP

When engine RPM is 2900 a simple rule of thumb may be used in lieu of the formula. It goes like this: "When the RPM is 2900, a loss of one BMEP will indicate a loss of 12 BHP." Therefore:

277—265=12 x 12=144 BHP

Now enter the Power Deviation chart (Figure II-55) with a BHP of 144. Move horizontally until the line representing gross weight is intersected, then drop vertically to pick up the correction from the bottom scale. *Apply this correction to predicted maximum power three-engine rate of climb.*

The completed computations answer the question: "Three-engine rate of climb . . . positive or negative?"

There are other factors that may bear on the pilot's decision to continue or refuse the takeoff, two of which are pertinent to this discussion.

Refusal speeds for reciprocating engine aircraft are based on the use of maximum wheel braking alone. In situations where both wheel braking and *propeller reversing* are available and used, it is possible to stop the EC-121K in as little as 60% of the predicted stopping distance—when the decision to abort is made at refusal speed. Therefore, it may be possible to stop an aircraft on the runway, which was past refusal speed when the decision to abort was made. It should be kept in mind that abnormal factors such as a wet or icy runway, poor brakes or a tailwind could cause actual stopping distance to exceed predicted stopping distance.

It may still be possible to get the aircraft airborne even though its gross weight exceeds the zero rate of climb gross weight. In this case, however, the aircraft is dependent upon ground effect and a positive rate of climb cannot be established until its weight is reduced and/or its configuration is changed. Use of ground effect to fly an airplane off is at best a marginal procedure and it should not be attempted except in an extreme emergency, especially if there are obstacles in the flight path near the end of the runway.

The foregoing discussion has been based on the EC-121K. However, the principle applies to all aircraft with four reciprocating engines and marginal three-engine takeoff performance under certain conditions.

Every pilot of a four-engine aircraft who is planning and preflighting for a takeoff should ask himself this question: "What will my three-engine emergency rate of climb be—positive or negative?"

If a quick and unequivocal answer is not forthcoming, take an extra minute or so to consult the performance charts of your aircraft. You may be glad you did.

T
re
op
th
fo
er
gl
pr
er
tu
ar
co
F
ar
th
er
w
h
to
o
p
th
w
e
a
w
w
a
a
c
r
b
F
k
u
e
s

It Pays to take Five!

The flight had progressed normally for about two hours at 2500 feet. Everyone in the C-47 was relaxed. The Plane Commander was at the radio operator's table eating lunch. Riding "shotgun" for the copilot was the first mech.

Over the intercom came a call for the pilot to come forward. Upon arrival he noted that the starboard engine oil chip detector light had come ON and was glowing brightly. Taking control of the aircraft he proceeded to secure the starboard engine. With one engine out the aircraft was unable to maintain altitude. The nearest airfield shown on the charts was an Air Force Base, 60 miles away. Attempts by the copilot to reach the Base on UHF were unsuccessful. Frantically scanning the area for a suitable landing area they came upon an auxiliary landing field of the Air Force Base where an outstanding single-engine landing was made. The crew and passengers were picked up by another aircraft and flown to their home base. This should have been the happy ending to what could have been a disaster. However, it is only the beginning of a sad tale.

With a sick bird 100 miles away at what was practically a deserted airfield, the home base became the scene of busy activity. Maintenance personnel were needed immediately. An engine had to be ordered. Guards were mandatory. The Safety Officer had an incident report to prepare. And on and on the wheels spun.

Guards for the aircraft were finally sent on their way with box lunches. Telephone calls were made and an engine located, but it would not arrive for about a week. With this news everyone relaxed a bit.

During the waiting period for the new engine, the crew was sent to remove the old engine. At last the new engine arrived and the task of installing it was begun. Mechanics were sent to the nearby Air Force Base to be billeted while performing the job. All kinds of support equipment was sent along for their use.

As always, the pressure was on to expedite the engine change. The aircraft was really needed for scheduled commitments. The engine change required about three days to complete. After completion a crew was sent to test fly and ferry the aircraft to home base. Everything was fine on the test hop until the prop was feathered to check this system. The pilot was unable to bring the prop out of feather. After repeated attempts to unfeather the aircraft was landed safely at home base.

Now the fun really began. All the "probable" reasons for the failure of the unfeathering system were checked. Nothing could be determined as being wrong. Finally it was decided that the prop feathering pump was the only logical component which could be faulty. Within a few hours a new pump was procured and installed. On the engine turn-up and prop feather check the prop went into feather as advertised but refused to come out of feather. Since there were no leaks in the system it was deduced that we had another bad pump! The third pump was procured and installed. You guessed it. Still the feathering system would not function properly. Two more pumps were procured and the same system malfunction was evidenced.

Several days later a mech who was in the engine change crew thought he had a solution to the problem. He recalled that when he was changing the pump from the old engine to the new, one of the small fittings was lost. Not having any of that particular size in his tool box he borrowed one from the Air Force. Unfortunately, the lost fitting was a "restricted" type fitting and the borrowed one was not. The restriction in the fitting caused the pressure to build up to 1200 psi necessary to unfeather the engine. Each time the pump was changed on the new engine this "borrowed" fitting also went along. This escaped notice by all personnel concerned. Had the mech utilized the Illustrated Parts Breakdown, he would have gotten the right part originally. This five-minute procedure would have saved procuring five pumps and several days of down time on the aircraft and the necessity of jeopardizing a flight crew and aircraft on a test flight.

Submitted by an ASO student at USC

The Albatross and the Storm

The purpose of the HU-16D flight was to provide routine training (radar and ADF approaches plus landings) for the co-pilot, radar operator and flight mech trainee at a remote island 156 miles southwest of the home station in Adak.

Takeoff was at 0705 local, nearly three hours before sunrise. Weather at the time was 300 broken, 9000 overcast, seven miles visibility. Temperature 42°, dewpoint 40 and wind 150 degrees at 16 knots, gusting to 25.

Enroute cloud tops were forecast at 6000 feet, and the freezing level at 2000 feet. Light icing and light turbulence were expected. Enroute winds at the cruising altitude were predicted to be 210 degrees at 20 knots.

The *Albatross* leveled off at 8000 feet, on top, and settled down on a southwesterly heading. Its intended track passed over the center of an island that possessed a steeply sloped east-west mountain range on the extreme northwest end. The principal features of this range were two volcanic peaks averaging about 5500 feet in elevation. The remaining surface of the island was relatively low and flat.

Around 0737 the *Albatross* entered cloud tops and began picking up light rime ice. All available anti-icing equipment, consisting of pitot heaters, prop anti-icers and airfoil de-icer boots, was in operation.

About three minutes later, indicated airspeed suddenly dropped from 130 to 120 knots and a sink rate began. Increasing the nose attitude didn't stop or slow the altitude loss and power was increased to 2300 rpm and 36 inches Hg as the aircraft descended through 7500 feet. Power was again increased to 2500 rpm and 46 inches as the aircraft passed through 7000 feet, still going down at a rate of 500 fpm. Airspeed was still 120 knots.

Then the *Albatross* hit severe turbulence and the indicated airspeed suddenly dropped down to around 60 to 75 knots.

In an attempt to get the nose over and pick up airspeed, the pilot maneuvered his plane into a semblance of a wingover but subsequently found himself in an extremely nose-down attitude. Using

ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —

maximum available power and plenty of muscle, he leveled the aircraft momentarily . . . and then the wild gyrations started all over again.

An extremely nose-high pitchup was experienced on the second go-round. Immediate full forward yoke against the stops didn't seem to help. While the pilot was struggling to get a wing down again, the copilot became completely disoriented and felt sure the aircraft was spinning.

Negative G-loads lasting as long as 10 seconds were frequent during this time, causing spare life jackets and loose items from the nav bag to float eerily about in the cabin. IAS remained in the vicinity of 70 knots and the vertical speed indicator stayed pegged at 6000 fpm down.

Finally a second recovery to a near level attitude was accomplished but the indicated airspeed immediately jumped to about 240 knots. Wanting to help, the copilot tried to reach up and pull back the throttles, but positive G-forces then being encountered kept his arm pinned down.

After what seemed like an eternity (actually about two minutes), the turbulence gave the suffering old *Albatross* a final vicious shake and turned 'er loose.

The situation still looked bad, however. Red failure warning lights glowed on the instrument panel. Various items of equipment, including a generator, no. 3 inverter and radar, were kaput.

The aircraft was heading 60 degrees off course, well below surrounding terrain clearance altitude, in the soup, and booming along at 240 knots indicated.

But the crowning blow was the added burden now created by nearly an inch of clear ice on portions of the wings and fuselage.

The pilot immediately started a max-power, max-angle climbout to get above the surrounding terrain, some of which was almost 2000 feet above his level recovery altitude. APU electrical power helped fill the gap created by the lost generator.

While climbing through 7000 feet, the pilot started a turn back toward Adak and got out an emergency transmission. The return flight at 10,000 feet terminated in an uneventful approach and landing.

Visual inspection of the plane back at home base was interesting. The aircraft sustained many popped rivets and looked sort of crinkly in the vicinity of the wing roots.

As soon as he could speak coherently, the flight mech trainee vowed he would turn in his flight skins.

In the debriefing, it was determined that the *Albatross* had passed almost directly over a 5920-foot peak located on the island of Tanaga (previously described).

After listening to the pilot's description of his encounter with violent up and down drafts, clear ice and St. Elmo's fire, the station aerologists concluded that a violent orographic thunderstorm had formed on the windward side of Tanaga's mountain range and that the aircraft had apparently flown through the center of it. A warm, moist 25- to 45-knot surface wind was known to be blowing across Tanaga from the southeast at that time and its rapid ascent upon striking the mountain range could easily have accounted for the severe turbulence and other conditions that plagued the *Albatross* at 8000 feet.

In evaluating this experience, Anymouse came up with the following recommendations:

- If at all possible, during night instrument conditions keep your crewman and passengers seated and strapped in with seat belts and shoulder harnesses snugly fastened . . . fortunately everyone was seated and strapped in throughout this incident and no one was injured.
- If radar is available, have the radar operator report all land mass areas (overwater flights) as well as areas of precipitation to the pilot in a timely manner . . . inexperience of the operator probably hampered maximum use of the radar in this case. The *Albatross* had been tracking a bit north of its intended course for some time before encountering the turbulence but the radar operator had not relayed this information to the pilots.
- Keep loose items of equipment put away or tied down when not in use. In this case, the items that floated about did no harm but the threat was present.
- Whenever possible, avoid flying at low/medium altitudes within 10 miles of small island land masses that have steep, high terrain features, especially during times when high surface winds are known to exist.

(*Primary emphasis should be placed on maintaining aircraft attitude when flying in heavy turbulence. Altimeter and airspeed indications may become erratic under these conditions . . . Ed.*)

In closing, Anymouse commented that "Had this flight ended disastrously on the side of a mountain it's quite likely that there would have been some conjecture as to why two experienced aviators were flying below the minimum safe instrument altitude. It is not inconceivable that circumstances similar to those encountered here may sometimes contribute to otherwise unexplainable mountain collision accidents.

Reader Questions Headmouse Answers

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

Oversafe?

Dear Headmouse:

While preflighting an S-2A . . . I found that the wingtop main gas caps were protected by a locking bar device that I had not been exposed to before. NATO markings and clean paint indicated the aircraft had just come from PAR.

The problem is this: The slot in the dzus button will not accommodate a standard dzus key which aviators normally carry. After climbing up on the wing and finding this mismatch of dzus key and dzus button slot there is a tendency to skip checking the gas level—after all, the gas gages will indicate the fuel level once the engines are started. If a survival knife is used, there is the hazard of cutting one's self.

If a pilot is deterred by this annoyance from checking the fuel level, then undoubtedly some of the plane captains are also.

Since this locking bar dzus slot is not compatible with a dzus key, it appears this device was not correctly designed or installed. Also, this bar appears to be just another drag and ice collecting item. I believe this "oversafety" item causes the loss of safety.

Perhaps you could explain the purpose of this device and how to open it. Should my dzus key have a narrow screwdriver on it?

WEEKEND-WARRIOR MOUSE

▶ Headmouse's investigation of the matter revealed the following:

1. Fuel tank filler cap safety latches are installed on S-2A series aircraft by NAS North Island during PAR cycles under Local Engineering Specifications (LES) 27-278 in compliance with ComNavAirPac Aircraft Bulletin 2-61.

2. The Bulletin states: Cases have been reported in which, because of improper locking of the fuel tank filler cap or loss of the filler cap roll bar, the cap was lost in flight resulting in the loss of most of the fuel from the affected cell. In two cases, a large quantity of fuel flowed into the wing center section and into the cabin creating a very hazardous condition. To reduce the probability of recurrence of this situation in PacFlt S-2/C-1 aircraft, this modification provides a safety latch which must be secured over the filler cap. The safety latch can be snapped down only when the filler cap is properly locked in position and serves as a warning device when the filler cap is not properly secured. When snapped in position the safety latch will also prevent loss of the filler cap in case of roll bar failure.

3. Two types of dzus fittings appear to be in use:

a. winghead

b. slotted flushhead

4. Mil-F-5591A, the specification controlling design of dzus panel fasteners states, "Screwdriver slots in flush and ovalhead types shall be such that a conventional (sic) blade type screwdriver may be used." This raises the question, what size is the blade of a "conventional" screwdriver?

5. Winghead type dzus fittings appear to be satisfactory while the slotted type which will not accommodate a dzus key has proven to be unsatisfactory. As a consequence activities not under ComNavAirPac in many cases have removed the safety latch altogether.

Conclusions: In view of facts presented in paragraph 2, the device should not be considered an "oversafety" item. Unsatisfactory dzus buttons should be replaced with ones that are satisfactory. This small task can be accomplished on the local level with minimum effort enhancing the safety of the flight, crewmembers and the aircraft.

A copy of your gripe together with these findings was forwarded to ComNavAirPac for appropriate action.

Very resp'y,

Headmouse

Rocket Loading Sense

Dear Headmouse:

Concerning rocket loading, paragraph 6, page 4, Air Weapons Bulletin 25, of 28 Aug 64 states, "An *audible click* indicates positive engagement of the detent with the detent groove."

The arming area here is located on a strip of pavement between the main runway and the taxiway. This is a very noisy area as F-8s and F-4s are the predominate aircraft based here.

The question is, can a man working such a noisy area, wearing his ear plugs, hear the supposedly audible click mentioned in the bulletin?

ANYMOUSE

▶ Your question was referred to the U. S. Naval Ordnance Test

Station, China Lake, California for comment. It follows:

"NOTS personnel performed the procedures given in AWB 25 on an F-8 aircraft using 5.0-inch Zuni rockets and an LAU-33/A launcher. The engine on the aircraft was run up to full power and the loading personnel wore regulation muff-type ear guards. Although loading personnel could not hear the click described in AWB-25, a positive click was felt both from hand placement on the round and on the sides of the launcher. The procedures were repeated several times, and it was ascertained definitely that upon feeling the click the round became properly detented."

It was recommended that the foregoing procedure be followed whenever excessive noise impairs normal hearing.

Very resp'y,

Headmouse

Mess Hours

Dear Headmouse:

We have all read with interest and respect your repeated warnings to get plenty of sleep, exercise and good food. We have studied the accident/incident/Anymouse reports caused, in part, by a less than alert pilot/aircrew. Yet, it appears that due to some reduction somewhere, meal hours at more and more naval air stations are severely restricted. In some cases, special general mess arrangements must be made 24 hours in advance; in many, officers' messes will not serve anything prior to 0630. For those of us launching in the early hours, nothing seems too good. And nothing below the old belt line is usually what we get. Can you help?

HUNGRYMOUSE

▶ We have had a number of informal reports similar to yours OpNav Inst. P3710.7B of 10 Feb. '65 states: "It shall be the Navy Department policy that naval airfields shall be available for the use of transient military aircraft to the maximum extent possible, and that the aircraft and crew shall be supported to the fullest extent possible within the capabilities of such activities."

Mess arrangements such as those you are concerned with are under the jurisdiction of the officer in charge of the BOQ. Perhaps, a letter from the commanding officer of your squadron to the commanding officer of the particular naval air station in question may be in order.

Very resp'y,

Headmouse

"Wonder what NATOPS has to say about this?"

Replacement of OpNav 34P1

Dear Headmouse:

Information is desired pertaining to the manual which has replaced OpNav 34P1. The only knowledge we have is the APPROACH report in the July 1964 issue that OpNav 34P1 is cancelled. An address of where the new manual can be ordered will be greatly appreciated.

VR-24 QUALITY CONTROL

▶ SecNav Notice 5100 of April 1964 states the new manual will be entitled "Department of the Navy Industrial Precautions." It will incorporate general safety precautions applicable ashore and will be distributed *only* to shore activities and fleet schools.

The Industrial Relations Office reports the Industrial Precautions Manual will be ready for printing during July 1965 and anticipates distribution to be completed during this calendar year.

SecNav Instruction 5100.10 of 18 March 1964, Department of the Navy Safety Program, states that the various bureaus will "integrate safety precautions into training and indoctrination programs and into technical and tactical publications and appropriate check-off lists."

In addition, this instruction states CNO will develop and issue a separate publication to the operating forces indexing specific precautions issued by the Navy Department. The initial index was published under OpNav Inst 5100.6 dated 4 Nov 1964. It will be published periodically under 5100 series notices.

OIR Notice 5100 of 24 June 1964 continues the applicability ashore of the precautions outlined in OpNav 34P1 until superseded by new publications.

Very resp'y,

Headmouse

Experience is the name everyone gives to his mistakes.

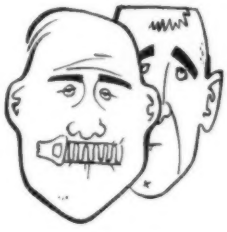
Oscar Wilde

SAFE FOR SOLO

When a beginner learns to fly, he is faced with two distinct problems.

The first problem, the airplane, is a "piece of cake." This precision piece of machinery can be mastered with sheer perseverance, practice, cool headedness and curses punctuated by an occasional swift kick in the Goodyears. The second problem, and by far the most difficult to surmount, is the flight instructor.

A flight instructor is a special superior breed of naval aviator. Nine feet tall, blessed with stout lungs; a boundless, vibrant vocabulary; he is also recognized by great courage,



1. SHOW HIM WHO IS BOSS This is done merely by keeping your mouth shut. He already knows he is anyway—the Lord told him so.

2. WIN HIS RESPECT AND ADMIRATION Tell him that your father is president of a large airline that is looking for pilots at a fantastic salary. Foreign students should hint that they are the sole heir to a winery that produces the finest of champagnes.

3. REWARD HIS EFFORTS It is well to let him know that you are aware of the "instructor whisky still" located at the solo field. Hint that you are almost "a fifth" of the way to soloing.

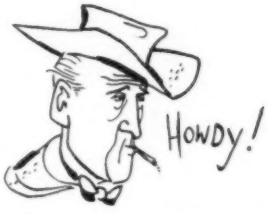
4. ADVISE HIM OF YOUR PROBLEMS Say you are constantly pursued by beautiful women—several of whom would like to meet him. All instructors are girl-crazy and this will get you extra flight time while he thinks it over. B'sides, it will keep his mind off your mistakes.

5. EXPRESS ADMIRATION FOR HIM Let him know how impressed you are that he can fly while eating a three-course lunch (two bags of peanuts and a coke) in the backseat. Show him how much you enjoy his selection of lunch music, coming in on the ADF, by beating out time on the stick and rudder. Instructors are egotistical and will mistake this for a compliment.

extreme skill, furrowed brow and mean little eyes.

Because the instructor already knows how to fly, he has the student at a complete disadvantage. Unimpressed with whatever skills the student might have had outside of naval aviation, the flight instructor is dedicated to showing, by his own faultless example and precise demonstrations, how completely unendowed the student is as naval aviator material.

To those who walk through the Valley of the Gold Wings, you are advised to follow these few common sense rules, culled from hither, thither and yon in dealing with this "Hercules of the Air."

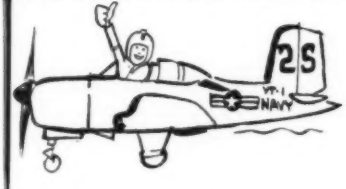


6. INDICATE YOUR AMBITIONS When waiting to meet the instructor, strike a "John Wayne" pose—unimpressed, unassuming. Examine everyone with a jaundiced eye. Wear a worn leather jacket and look bored with the whole procedure. He will know immediately that you are interested in becoming an instructor and give you special attention.

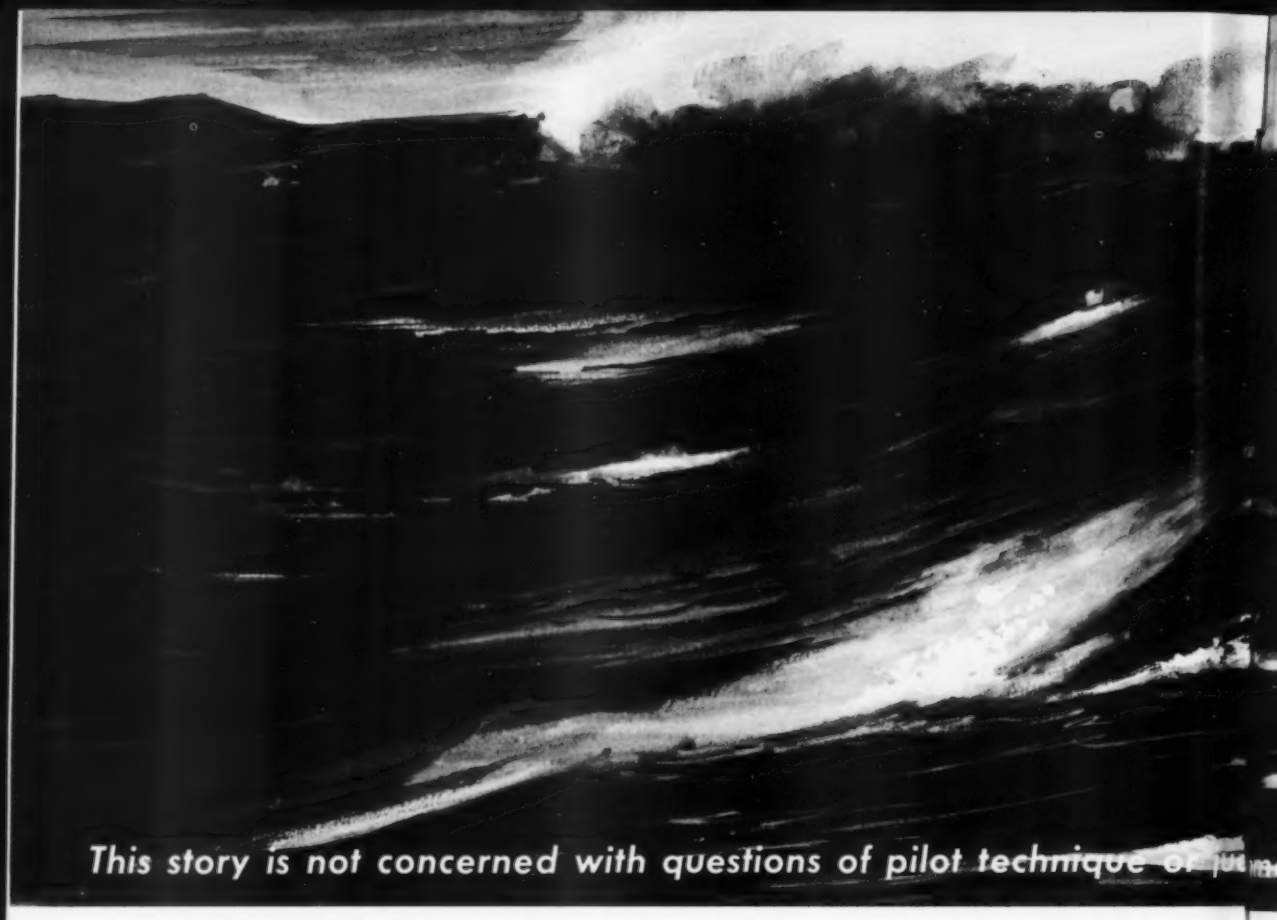
7. DEMONSTRATE YOUR ABILITY Skid all turns and fly with one wing low. When the screeching, hollering and bellowing gets beyond human endurance, show him that you have recognized an intercom failure. Disconnect the radio jack and hold it up where the instructor can see it. Be alert for signals to follow!

8. DISPLAY THE RIGHT MENTAL ATTITUDE Convince the instructor that you are a lunatic. As a start, display the sign "non compos mentis" on the back of your hardhat where he can easily read it. Remember, instructors solo students only when they are convinced that there is nothing else that can be done and that the student is bent on committing suicide anyway. On the solo-check flight, if you louse up enough landings, the instructor will leave the airplane to save his hide.

9. OBEY INSTRUCTIONS IMPLICITLY If the instructor tells you to go to ....., check your survival gear, file a flight plan and take off!



10. AVOID UNNECESSARY RISKS Fly solo as much as possible!

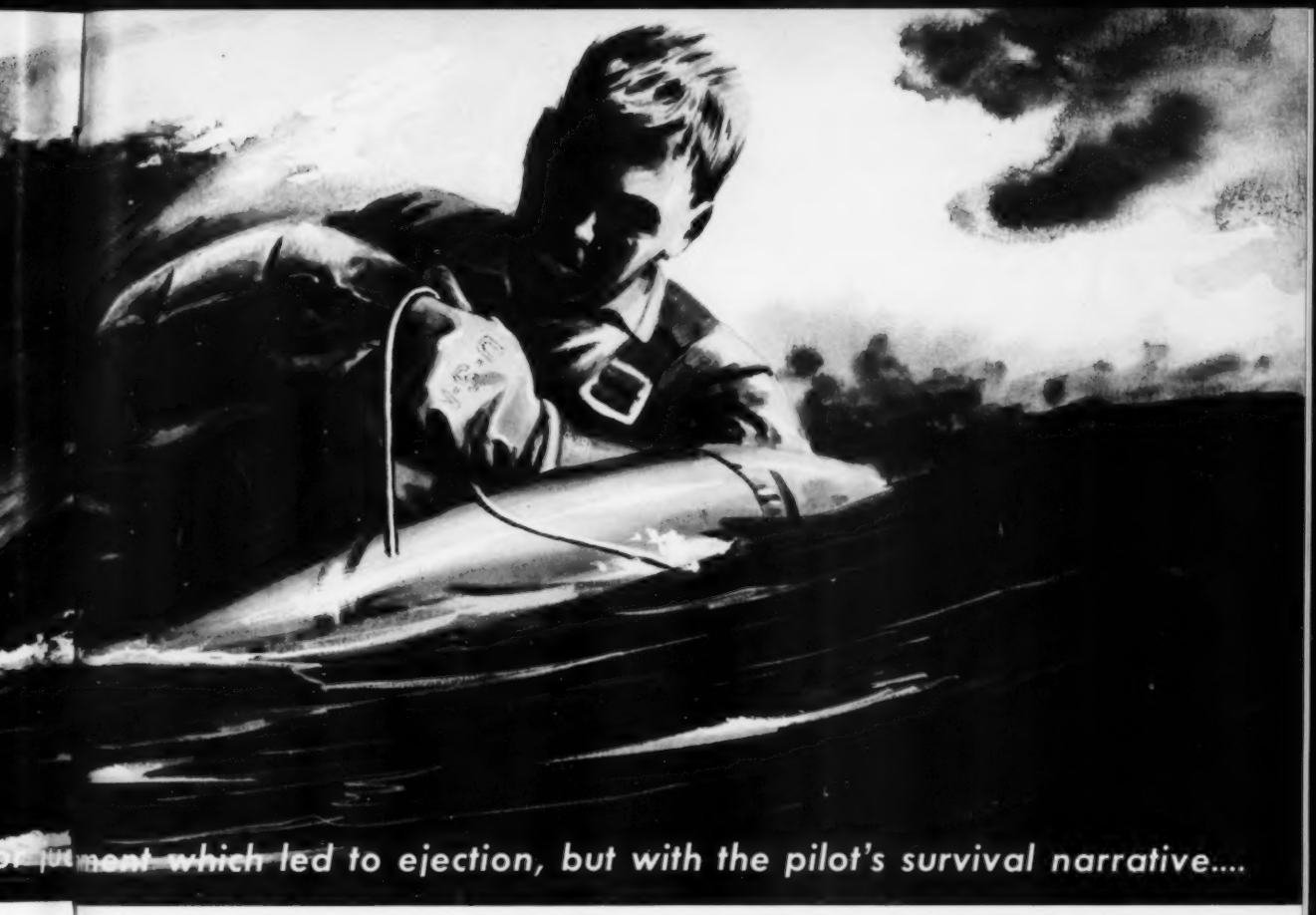


The cord had become disconnected and the entire string of items was missing.

Sea Trial

By this time we were in the overcast still very much in the spin as the controls were ineffective. Again I told the rear seat passenger to eject. I had told him to eject before. He had acknowledged, asking, "Do you want me to get out?" to which I had replied, "Yes, get out. Eject!"

"After telling him again to eject, I started to reach for the curtain which I found behind my head. I pulled it halfway and waited another moment to determine if the rear seat passenger had ejected. (*Apparently the passenger was unsuccessful in any ejection attempt; he was never found.—Ed.*) I then pulled the curtain the rest of the way and I think I saw water immediately before I went out. I knew the seat would hurt me since I was against or almost against the canopy. It did. (*When the pilot pulled the face curtain, apparently he was hanging upside down in the cockpit by the shoulder harness. He was ejected nearly straight down toward the water. Because of negative Gs he was an estimated 3" to 6" off the*



...ment which led to ejection, but with the pilot's survival narrative....

seat, giving the seat a head start before it contacted him. Later it was found that he had sustained a mild compression fracture of a vertebra.)

"Shortly afterwards I felt the wind blast and then some 800 to 1000 feet above the water the chute opened with tremendous force, knocking my breath out. The pain in my chest and back was severe and as I was attempting to get my breath, I saw the aircraft strike the water in a flat inverted attitude off to my left. I also observed another splash next to the aircraft which could have been the seat. At any rate, the wind took me away from the aircraft crash and I prepared for the water landing. At this point I wasn't thinking too well because the impact of the ejection and chute opening had left me pretty groggy. Had the chute opened much later in my descent I probably would have drowned before I got my breath.

(*Before entering the water, the pilot tried to locate the lanyard leading to the life raft and attach it to the life preserver but was unable to find it.*)

"I hit the water but before I could release the chute it was dragging me through the water. After about 50 feet I finally got the chute released (the life preserver had worked out from under the parachute harness and covered the release). Then I pulled the CO_2 bottle toggle on the right side of the life preserver. It didn't work but the left one did. I used the oral inflation tube to blow it up even more. As my lanyard wasn't hooked, the raft pack was floating away with the parachute and harness. I swam for the seat pack and luckily retrieved it and removed the raft. The sea was extremely rough.

"It took me quite a while to get the raft out of the seat pack and inflated. I couldn't find the lanyard leading to the raft, either while descending or in the water. As luck would have it, I opened the wrong end of the seat pack first (I couldn't tell the large end from the small end). When I finally opened the raft end of the seat pack, I had to pull the entire raft out before I could find the CO_2 toggle.

Continued

"The raft inflated properly and I entered at the small end, pulling it underneath me. By this time I was exhausted and I found it difficult to breathe because of the severe pain. I left the sea anchor out. After I was in the raft, I took off my hardhat, oxygen mask, gloves and kneeboard and put them in the bottom of the raft. All survival gear, such as the radio, mirror, desalting packs survival packs, was still hanging over the side of the raft attached to the lanyard which ran through the seat pack. I pulled the radio and mirror in and let the others remain in the water because it was already crowded in the raft and by this time every little task required considerable effort. (*The PRT-3 should have been actuated automatically on seat separation but it was not. The pilot pulled the plug and felt the radio get warm but no one heard any signal.*)

"The pain from my back and ribs was very uncomfortable and, in addition, I was shaking violently from wind chill and perhaps a slight touch of shock. Later, when I went to retrieve the gear hanging from the side of the raft, the cord had become disconnected and the entire string of items was missing.

"I was in the water approximately four hours before I was picked up by helicopter. During this time I drifted several miles from the crash scene. One A-4C, an F-8E and a KC-130F came within a mile of me but all failed to see me due to the rough seas. I activated a night distress signal to the A-4C but the pilot did not see it. The F-8E did not see my day-smoke signal. I would estimate the sea state as being swells 10 to 15 feet high with wind 20 to 25 knots.

"I was thrown from my raft once, at which time I lost all my survival gear which included my remaining flare I had placed on the raft floor and my hardhat and oxygen mask. When the KC-130F came over, all I could do was wave.

"Reboarding was very difficult as I was chilled, exhausted, weak and in considerable pain. Luckily, the raft did not get away from me although I still had not connected the lanyard to my life preserver.

"After the aircraft flew nearby without sighting me, (I had no signaling means except waving my arms), I began to feel my best hope for pick-up would be a destroyer or any ship dispatched to the area. I had particularly wanted to retain my hardhat because it would not only keep my head warm that night but it had reflective tape which I knew would be helpful in locating me. (*Because he went flying straight from a meeting, the pilot was wearing green utilities, the uniform of the day, instead of a flight suit. Wet green utilities, investigators pointed out, blend perfectly with sea water.*)

"The first helicopter to see me lost me in the rough sea as he was turning to make his approach. Another flight of three helicopters approached and as one approached to pick me up, another stood by. I stayed in the raft until the sling was lowered to the water. I then jumped from the raft and swam to the cable and sling but the sling separated from the cable hook. I retrieved the sling and rehooked it, but it came off again. During this time, it felt as if the sea would almost take me up to the helo. Finally, I got the sling back on the hook and held it until I entered the sling. I was hoisted aboard the helicopter at approximately 1530."

The helicopter pilot reported difficulty in sighting the survivor in the 10- to 15-foot swells; winds were 20 to 25 knots. The survivor was not spotted until the helo was only 100 yards from him.

After his ordeal was over, the F-9 pilot made some comments on his experience with his survival equipment:

"The poncho type affair which is attached to the life raft helped considerably to ward off the chilling wind. However, the outside of the poncho was the exact same color as the ocean on this particular day. When an aircraft approached, I would quickly unsnap the poncho to show the underside which is high visibility red. This is a poor procedure though because the wind and sea were making so much noise that it was difficult to hear them approach. Therefore, I would not display the high visibility side soon enough. Also, each time I had to unsnap, what little warmth I had gained was lost. I realize that in a combat situation, one may not want to be seen by everyone. However, there should be some easy way whereby this poncho could be reversed, perhaps on a permanent basis in peacetime, with the high visibility side out. In wartime it would be simple enough to reverse back to the dark gray side. (*The flight surgeon investigating this accident believes this camouflaged outside color of the poncho contributed significantly to the pilot's not being sighted for four hours.*)

"I felt the sea anchor was quite useful in stabilizing the raft during the high seas. The raft, itself, was much more seaworthy than I had expected since I was only dumped once.

"Though the survival phase was not perfect," the investigating flight surgeon reports, "I doubt that anyone else suffering from the same degree of pain, fatigue, cold and exhaustion could have thought and acted more rationally."

LAST MINUTE EJECTION

Immediately after a normal night catapult launch of an F-4B, the RIO heard a muffled explosion or rumble and saw a flash from the starboard side of the aircraft. Witnesses saw a shower of sparks or balls of fire from the starboard engine.

The pilot told the RIO that the starboard engine had flamed out and that he was selecting afterburner on the port engine. He then reported a fire warning

light on the starboard engine and that he was securing it. Almost immediately, he reported a fire warning on the port engine and that he was coming out of afterburner. At this time, the aircraft was at 500 feet altitude, 180 knots IAS, gear up, and full flaps.

From that point, the aircraft began to lose altitude and airspeed. As the situation developed, the RIO placed his hands on the face curtain handles and properly positioned his body and feet for ejection.

At an altitude of approximately 400 feet, the pilot stated that he was jettisoning the external fuel tank and at approximately 300 feet, he informed the RIO that he was reselecting afterburner on the port engine. The aircraft continued to settle and at an altitude of 100 feet, 140 knots IAS and 4½ miles ahead of the ship the pilot told the RIO he thought the RIO had better eject.

The RIO ejected. The pilot did not. The aircraft continued to lose altitude. Observers on the carrier saw it disappear roughly in line with their horizon and without flash or explosion.

The RIO's parachute deployment and water entry were almost simultaneous.

"There were no noticeable forces as I pulled the curtain," the RIO recalls. "I considered releasing the curtain but decided against it. While still holding the curtain firmly, I felt spray in my face followed immediately by a slight tug and I entered the water. I went under, entangled in shroudlines, survival gear and parachute.

"After struggling for what seemed several minutes and making little if any progress in getting clear, I pulled the toggles on my Mk3C. The left side inflated but I was unable to actuate the toggle for the right side. (After examining this when back on board ship and inflating the right side, I believe that in the water I was pulling the toggle at an angle instead of straight down. This would prevent the actuator from puncturing the CO_2 cylinder.)

"I came right to the surface.

"On surfacing, I heard a slight hiss and noticed a large object on my back. On further investigation, this turned out to be my raft. I had not actuated the releasing mechanism of my seat pan." *(The raft probably inflated on severe impact with the water.—Ed.)*

"I had some difficulty in finding my parachute rocket jet fittings, locating them 'under' my Mk3C. (I was not wearing gloves.) After releasing the fittings I turned on my mercury light. I had little luck in getting clear of my shroudlines. I could not see very well because there was a considerable amount of JP-5 in the water that was stinging my eyes. I released the left lap belt and climbed into the raft face down. The plane guard helo came up within a few minutes.

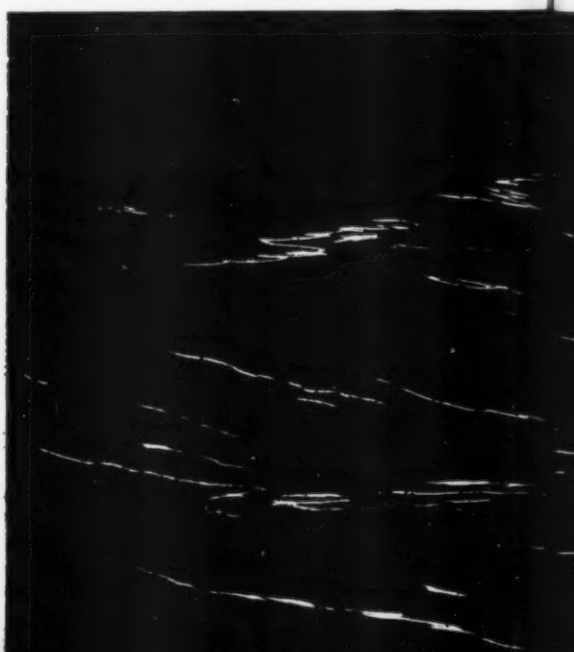
"When the helo arrived I went back into the water and attempted to indicate to them that I was tangled in the shroudlines. The short rest in the raft had evidently cleared my head as I had little trouble freeing myself from the lines.

"One of the crewmen from the helo appeared as I was getting clear of the last lines. After dropping the crewman, the helo continued to search the area for the pilot. The helo returned overhead about 10 minutes later. During this time the crewman had considerable trouble with the JP-5 getting in his eyes, more so than I, since I seemed to be floating higher."

The crewman in his statement says that in spite of swimming into the waves with the idea that he and the survivor could get out of the JP-5, he could hardly see at all. His nose was stopped up and his breathing almost completely shut off. "When I opened my mouth to breathe," he says, "all I got was a mouth full of JP-5."

The helo pilot reported that he had a problem sighting the survivor because of poor visibility due to JP-5 and salt water mist necessitating many search approaches at 40 to 60 feet altitude. The pilot described the scene as a wide white pool of JP-5 with two lights in the center. (He described the action a bit later as "operating in a bowl of JP-5 mist.") As the helicopter approached within a hundred yards, the two "lights" became reflective tape on two helmets.

"One man was visible clinging to a raft with his



hardhat on, and the other hardhat was empty, floating about 100 feet away," he recalled.

The helo left the scene to put a light outside the JP-5 and began a doppler approach to the survivor and crewman. (*The third endorser to the AAR states, "Action has been taken to insure that the rescue helicopter is, on each night mission, equipped with three electric marking lights as prescribed in the UH-2A NATOPS Flight Manual."—Ed.*)

After picking up the survivor and the crewman, the helicopter pilot continued to search for the pilot without success. The RIO was uninjured although during entry into the helo, his helmet had struck against something on the helicopter. He was returned to the ship.

Helicopter and surface force search for the pilot throughout the night and into the following morning failed to locate him.

The accident was attributed to a material failure of the starboard engine causing a flameout and fire warning, followed shortly thereafter by illumination of the fire warning light on the port engine.

"The pilot was in no way responsible for the accident," the investigating board reported. "He did err in his decision not to eject while still within the envelope. It is the opinion of the Board that once the port fire warning light illuminated, the pilot and RIO should have ejected or the pilot should have ignored the warning light and climbed to a safer altitude utilizing the afterburner. Although the RIO escaped uninjured, he had every justification for ejecting earlier instead of waiting for the pilot's command.

"It is well recognized and understood," the Board states in its recommendations, "that pilots have a natural reluctance to abandon an aircraft when they believe there is even a remote possibility of saving the situation. However, it is recommended that all levels of command continually stress the importance of recognizing when a situation has progressed to the point where considerations and attempts at trying to save the aircraft must be put aside in favor of personal survival. All aviators and aircrewmen must periodically review in their own minds the various emergency situations that could confront them at any time and (they should) have a plan of action well thought out. They must know the safe ejection envelope for the type of equipment they are operating so that timely escape action will be instinctive."

Endorsers to the Aircraft Accident Report summed this up:

- "During this emergency, the pilot must have felt the 'false security' afforded by the cockpit, and the Board's comment is well-stated in that effort should be placed in favor of personal survival when the situation has deteriorated to the point that saving the aircraft is doubtful. This was a prime example of waiting too late to abandon the aircraft in a doubtful situation."
- "It is recommended that all commands continually impress on the flight crews that if the situation is marginal it is incumbent on the crew to err on the conservative side."

REFLEX ACTIONS

THE human body is a fine piece of equipment with built-in features that would make an automation expert turn green with envy. How convenient it is that so much internal action is so automatic. Even such controlled activities as breathing go their life-giving way without interruption when attention is diverted elsewhere.

Some automatic actions, however, can produce trouble. Reflex actions were built into his system to protect man from the emergencies arising in his natural habitat. They can cause difficulties, however, in the artificial environments which he has created for himself. Responses which make man ready for physical combat make him less capable of dealing with the abstract decisions necessary for his survival in these new surroundings.

Some actions can be controlled by directive but these automatic responses do not come under that heading. Some can be managed by personal discipline and good intentions. Reflex responses are equally impervious to this approach; yet, they can be controlled. The key to their control is given many fancy names by the experts but they all come to one thing, job proficiency. Each individual must be aware of his limitations, aware of the demands of his job—and then practice, and then practice some more! Overlearning each step of the correct procedure until it becomes so automatic that it replaces the old is the key to survival. Emergency procedures particularly should be practiced to such an extent that any unanticipated event only sets off a series of corrective responses rather than producing undue emotionality. Once these things are learned, they must be repeatedly relearned.

Don't think you know, *know you know* and remember—you are never too old to find that doing what comes naturally may be the wrong thing to do.

—Anchard F. Zeller, Ph.D.
Aerospace Safety,

Shattered Glass

AS an A-3B departed the initial point on a run at 500 feet, 380 knots, a flock of birds appeared directly ahead of the aircraft—too close for evasive action by the pilot. One bird struck the fuselage just to the starboard of the pitot tube. Another shattered the lower inboard corner of the starboard windshield, sending a spray of small glass particles through the cockpit.

The bombardier escaped serious injury because he was "on the scope" at the time. The pilot was flying with his helmet visor up; he protected his eyes by covering them.

"The reluctance of most pilots to lower their visors while making low altitude high speed run-ins is indefensible and must be overcome," the squadron skipper said in his report. "Some pilots argue that the dark visor restricts instrument panel visibility but this is not valid. A more probable reason for not lowering the visor is that it requires a positive action which most pilots have not accustomed themselves to and 'forget' to do."

The pilot in this incident, the skipper says is now a confirmed visor-down adherent and has briefed all available squadron pilots on the merits of that procedure.

Tie Up

A RECENT inspection of a seat pan showed that all the gear was neatly tied together by a strand of cord. The only trouble was that the day-night distress signal flares were tied together so that you couldn't ignite one without first cutting the cord and there might go half of your gear. It is suggested that the flares be tied about two feet apart, thereby permitting you to light one without endangering the other or cutting the retaining line.

—Safety Memorandum
ComReconAtkWing One,
NAS Sanford

First Aid Kits

THE aircraft maintenance officer reported several cases of finding first aid kits that had been opened, used and then reclosed without replenishment. This results in aircraft being equipped with incomplete first aid kits.

Council Recommendation: That training officers and the aviation safety officers remind all pilots and aircrewmen of the necessity of reporting on the aircraft yellow sheet any time a first aid kit is opened.

—CNAResTra Safety
Council Minutes

Water Survival Training

IN MANY areas, water survival training (active participation, boat drag, and so forth) is done on a yearly, squadron basis. I feel this method of training leaves a great number of aviators deficient for periods up to a year after joining the squadron (the case of the subject pilot). This phase of training should be done on an individual basis as is the annual physical examination. Thus the entire squadron would be current in water survival at all times.

—Flight Surgeon's Recommendation in MOR

Fire

AS FIRE broke out after the SP-2H's runway crash, the copilot received second-degree burns of the face and hands. He only partially raised a perfectly functioning escape hatch, then gave up. He sat in the cockpit dazed, slow to move and was the last out of the plane. When he crossed from the right-hand seat to the left-hand seat, he had to face the flames to go out the pilot's escape hatch. As he crossed over the center of the cockpit, he put his hands in front of his face to protect himself from the flames coming from the flight deck cabin. He was not wearing gloves; his hands were seriously burned.

He showed good headwork in lowering himself to the ground by gripping the inside of the cockpit with his right arm. He landed on his feet but did not fall. The pilot in this same accident jumped to the ground and in doing so sustained a moderate compression fracture of the spine.

Nearly Too Late

AMONG the board's conclusions was that the pilot's decision to eject at 500 feet was at too low an altitude to ensure survival and that his wanting to save the aircraft nearly cost him his life. As it was, he may have survived only because the aircraft just was in a favorable attitude for ejection when he did eject.—*From an AAR*

AAR Recommendation: That minimum ejection altitudes when in an F-8 spin be restressed.

NASC Comment: NATOPS, safety instructions and just plain good common sense dictate that when you hit the minimums, *go!*

Mask Policy

WE HAVE noticed that pilots have become lax in the wearing of their oxygen masks from the chocks to takeoff. Those seemingly "insignificant" oxygen gripes found at the end of the runway prior to takeoff place the pilot in the position of "I'll get it fixed when I get back" or hopefully, "I'd better get it fixed now." At the very best, valuable time is lost by having to taxi back for repairs. The worst, of course, is that we have another undetermined, fatal accident on our hands. *Wear the mask from the very start and depart the flight line knowing your oxygen system is operating properly.*

—Aviation Safety Summary MARTC Glenview

Mask Cleaning

A RECENT Aviation Safety Summary reported that the number of oxygen masks being turned in for monthly cleaning is dropping off each month. *A dirty oxygen mask can be a dangerous oxygen mask.* BACSEB 27-54 outlines mask disassembly, cleaning and reassembly procedures. Many riggers recommend that oxygen masks in constant use be cleaned every week. Persons using their masks only occasionally should have them cleaned at least every two weeks. A mask should be cleaned monthly even if it is not used at all.

Visor Payoff

What? During pullout following practice antisubmarine rocket firing run, the right half of copilot's windshield was struck and shattered by foreign object.

Why? Exact cause is undetermined. It is believed that a fragment of the rocket or a dislodged stone was thrown into the path of the aircraft.

Comments: Injury to copilot and aircrewman consisted of small superficial cuts. Injury to copilot was minimized by use of proper flight equipment *including the visor on his APH-5 helmet.*

Good procedures do pay off.

—NATC Flight Safety Bulletin

P-2

After passing low station during an instrument training flight, the P-2 instructor pilot told the pilot, who was hooded, to execute a missed approach.

Upon waving off . . . the gear handle was inadvertently moved through WHEEL UP into BOMBS JETTISON.

As soon as the pilot realized what had happened, he moved the gear handle back to the wheel up position, but by this time the bomb-bay doors had opened and the bomb-bay tank shackles had partially released.

It was then that the pilots first realized that the safety latch (thumb trip guard) normally located between WHEEL UP and BOMBS JETTISON was missing. This condition allowed unobstructed movement of the landing gear handle through WHEEL UP into BOMBS JETTISON (see photograph A).

While the plane captain was proceeding to the radar well (to take a look at the bomb-bay compartment from an observation window) the pilot thought he heard additional hardware breaking loose in the bomb bay and he immediately opened the bomb-bay doors using the normal system.

Upon reaching a vantage point in the radar well, the plane captain saw that the starboard bomb-bay tank (port bomb-bay tank not installed) was partially disconnected and hanging below its normal position.

A faulty jack box in the radar well prevented ICS communications with the cockpit so the plane captain returned to the flight deck to personally report to the pilot.

After being briefed, the pilot instructed the plane captain to pull the normal bomb-bay doors circuit breaker and then return to the radar well with a mike connected by extension line to a flight deck ICS jack box. By now the aircraft was approaching home base.

After establishing communications with the plane captain in the radar well, the pilot began closing the bomb-bay doors slowly with the alternate control switch. As the doors were closing, the forward vent line of the bomb-bay tank completely disconnected, allowing the tank to drop abruptly to a vertical position, with the lower end protruding out of the bomb-bay compartment.

A high volume fuel leak began simultaneously

Absence of thumb trip guard stop at BOMBS JETTISON was not detected until mishap occurred.

with the disconnection of the forward vent line and seconds later the closing bomb-bay doors ground to a halt against the sides of the partially protruding tank.

After reporting this sequence of events to the pilot, the plane captain beat a hasty retreat out of the radar well to escape the suddenly heavy concentration of gas fumes.

While circling over home base, the pilot talked things over with squadron personnel who had taken up positions in the control tower upon learning of the emergency.

The squadron CO decided to have the pilot try to dump the tank into the ocean just offshore.

By executing a 2-G pullup at 200 knots, the pilot managed to rip the tank completely loose. It fell end-over-end into the ocean about a mile offshore.

After landing (with jets OFF), the pilot elected *not* to use reverse thrust during rollout in order to avoid the possibility of sucking fumes and raw fuel forward into the hot areas around the engine exhaust systems.

Observers in the tower were able to see a heavy jet of fuel pouring out of the bomb-bay compartment as the aircraft rolled down the runway. *The bomb-bay doors were left partially open prior to landing in order to help ventilate the interior of the aircraft.*

After braking to a stop, the pilot opened the bomb-bay doors all the way, shutdown the engines and ordered his crew to abandon the aircraft. The crash crew moved in immediately and plugged the severed center tank drain fitting with a wooden peg before allowing the plane to be towed from the runway.

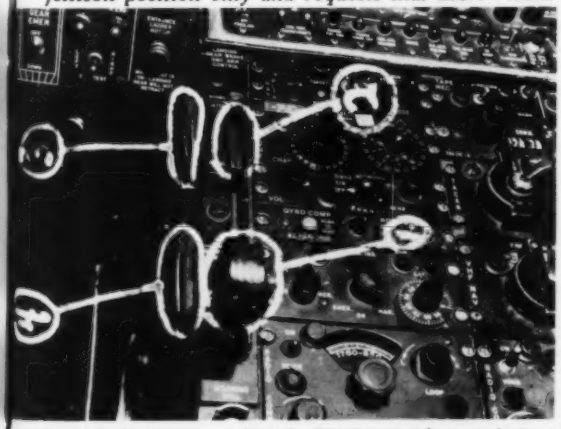
Investigation disclosed that the missing safety latch (between WHEEL UP and BOMBS JETTISON) was removed by a mech who had apparently misinterpreted the write-up on his work order. His assigned task had been to remove a similar safety latch (between

BOMB BAY TANK JETTISON

the wheel down and emergency/parking brake positions) in order to standardize the cockpit of this particular aircraft with respect to the other squadron aircraft, but he had proceeded to remove *both* safety latches, thinking this was what the work order intended (see photos below).

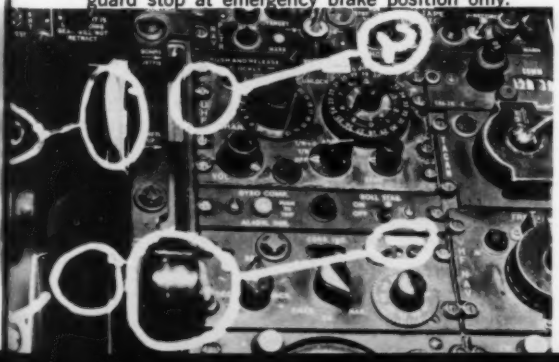
The maintenance work load was exceptionally heavy at the time and this job was not subsequently inspected, either by the Quality Control Division or by a shop supervisor.

(BuWeps msg 172100Z—March 1965 indicates that BuNos 135545 through 135621, 140151 through 140160 and 140962 through 140973 were equipped with thumb trip guard (safety latches) stops at both the bomb jettison and emergency brake positions in original production. It also states that BuNos 140430 through 140443, 140974 and subsequent aircraft were manufactured with the safety latch at the bomb jettison position only and requests that users recommend a standard (cockpit) configuration. Ed.)



Early BuNos were equipped with thumb trip guard stops at both bomb jettison and emergency brake positions.

Squadron work order required removal of thumb trip guard stop at emergency brake position only.



The absence of a safety latch between WHEEL UP and BOMBS JETTISON was not noticed until this incident occurred, 10 days later, even though seven different pilots and three plane captains had flown the aircraft on three separate flights during the interim. On these flights, the landing gear lever had been actuated without mishap.

Trying to determine why the bomb-bay tank had not jettisoned completely, the investigators learned that while the system had functioned normally from an electrical standpoint, the disconnect assembly in the bomb bay had malfunctioned (hooked up incorrectly) and prevented a complete release of the tank. *(See P-2 Murphy article on page 45. Ed.)*

The evidence points to maintenance supervision as being the primary cause factor in the removal of the wrong safety latch. Under the strong pressure of heavy operational commitments, plus a large aircraft turnover, shop quality control was considered to have been one of the first areas in which diligence was relaxed somewhat. However, quality control becomes even more essential during critical times when maintenance work is accelerated.

The unfortunate selection of the mech assigned to this job was another contributing factor involving maintenance supervision. Apparently the mech was not aware of the importance of the safety latch between the wheel-up and bomb jettison positions. Consequently, he did not question his interpretation of the intent of the work order.

The following recommendations resulted from the investigation:

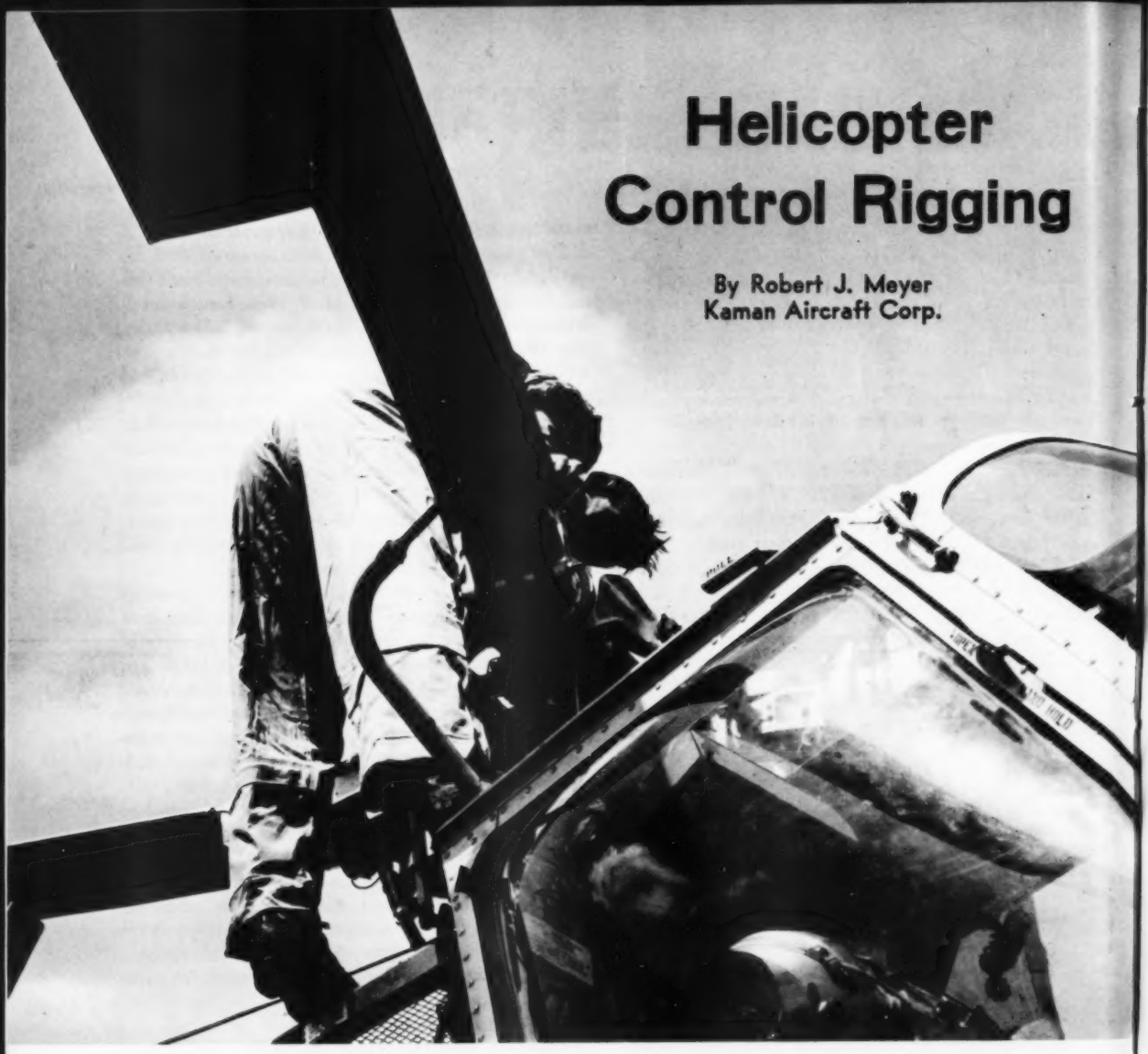
- The importance of maintenance practices and quality control inspections must be continuously emphasized at all levels of command.
- Aircraft revisions for the purpose of standardization should be inspected by the Quality Control Division.

At the present time, a pilot cannot automatically assume that all P-2 cockpits (particularly in the older models) are standardized. The older birds have been around for about 10 years now. This means they've changed hands a lot and undergone quite a few overhauls.

Take a lesson from this incident and preflight your cockpit also. The few seconds required to do this might save you some embarrassment later on.

Helicopter Control Rigging

By Robert J. Meyer
Kaman Aircraft Corp.



A thorough understanding of the theory of operation of a device is most helpful before attempting to adjust or rig it. Unfortunately, human nature being what it is, most of us dislike spending the time required to study related manuals or instructions, even though experience has proven that much time would be saved and frustration avoided by so doing. When the object being worked on is an aircraft or a component thereof, the element of safety is even of greater consequence, especially if the aircraft is a helicopter.

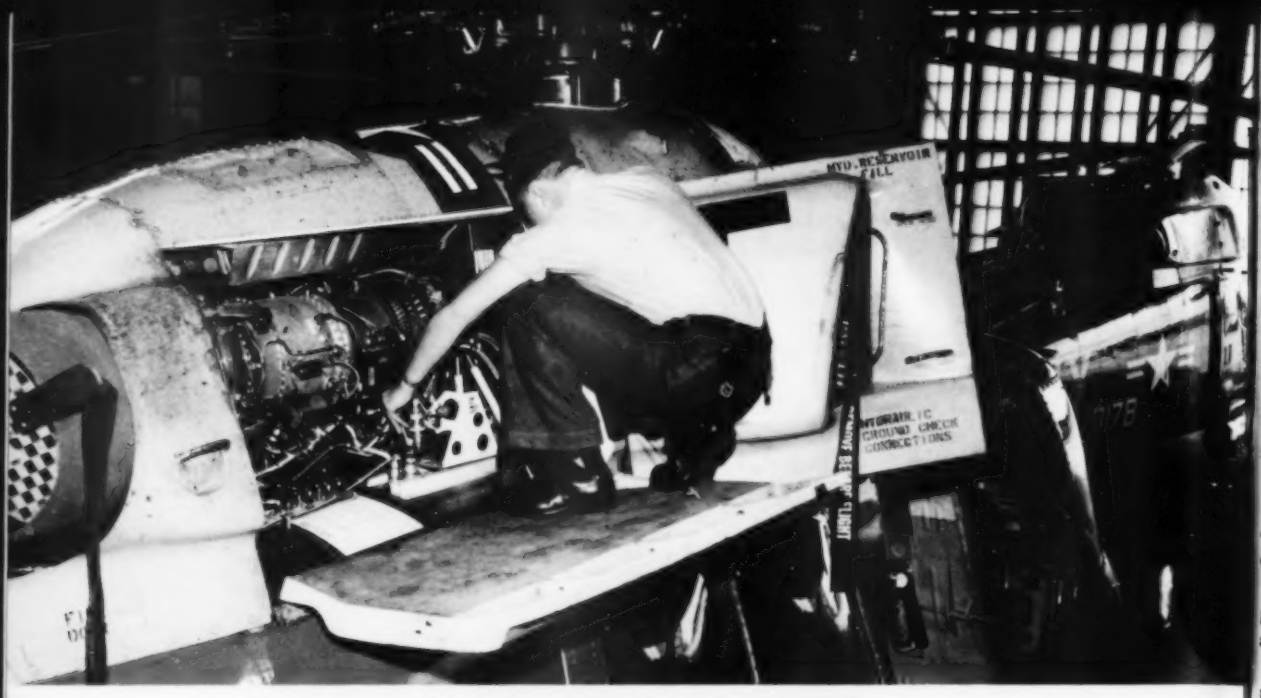
The helicopter systems most related to performance and subject to adjustment and rigging are the flight controls, rotors, and power plant controls. The lower or nonrotating flight controls are similar to their fixed-wing counterparts in that they are set to specific "throws" and "neutral" positions. Variations from these criteria can result in insufficient travel or binding; incorrect relationship in the functioning between two or more interlinked systems; uncomfortable stick and pedal flight positions; roughness; and noises. The interdependence of the upper or rotating control system and the rotors is such that they are best discussed together. These systems govern

the output control and blade tip path track of the rotors which are directly related to helicopter performance. Helicopter power plant control rigging, especially when turbine engines are involved, is quite critical. Idling settings must be low enough to permit rotor disengagement and high enough to insure against inadvertent cutout or flameout. The proper ratio of power control with changes in collective settings must be attained as well as adequate power throughout the entire flight regime to meet performance requirements.

Misrigging or maladjustment of upper helicopter controls or rotors can result in roughness due to blades being out of track; insufficient control, which can result in a flight safety concern; incorrect autorotation RPM; and generally poor flight performance. Misrigging or maladjustment of power plant controls as indicated earlier can result in cutting-out or inadequate power. In addition, especially as related to turbine engines, improper settings can cause overtemps or overspeeds which necessitate premature engine replacement.

Proper rigging and adjustment is essential for good performance. Good performance not only benefits the operator by providing the desired flying characteristics, but reduces abnormal loads and out-of-limit conditions which if ignored can adversely affect component lives and increase maintenance problems. How do you obtain these benefits?—by a thorough understanding of the theory of operation

Proper rigging and adjustment of flight controls is essential to good performance.



Turbine power plant control rigging is quite critical. . .

and mechanism of the component being adjusted or rigged; by close adherence to instructions provided in applicable manuals; and cooperation between mechanic and pilot.

On the practical side, a reminder is in order to insure that all connections are properly secured and safetied after adjustments are made. Due to the obscured locations of some parts of control systems and power plant installations, this is an item that is easily overlooked and can have dire consequences.

For those who question the establishment of this topic under the category of nonroutine maintenance, it is agreed that, like component replacements, it could easily fall under routine maintenance, depending on the circumstances. The nonroutine category was determined as the better choice inasmuch as much rigging and adjustment is accomplished as a result of operational "crabs." This brings us to a final word of caution. Once a component is properly adjusted, including those making up such a complex machine as a helicopter, major changes are highly unlikely: Performance does vary as a result of atmospheric environment changes and is to be expected and corrected as required. Minor changes also develop as a result of linkage wear, blade finish condition and power plant age. There are also occasional difference of opinion between helicopter drivers which require pacification. However, *repetitive changes, especially in the same direction, can be a warning of impending failure!* Such a condition should be thoroughly analyzed before additional adjustments and operation are permitted!

Inasmuch as rotor blade tracking is one of the more common line-level rigging and adjustment requirements peculiar to helicopter operations, let's consider the subject at this point.

Blade Tracking

Helicopter rotor blade tracking is somewhat controversial in the military and industry, especially as related to the method to be employed. As with fixed-wing aircraft propellers, the basic requirement is a reference point against which the path of different blades can be measured. Due to the possible aerodynamic variations, it is necessary to track helicopter rotor blades while turning at specified operational speeds, usually at the low collective pitch setting. This requires the utmost of caution and, preferably, much properly-supervised experience when the tracking reference device used is the commonly known tracking flag. The degree of concern varies with the condition of the ground surface on which the job is being performed, the size and height of the rotor blades and the prevailing wind conditions. The respective manufacturers' instructions should be thoroughly understood and followed. A few general

recommendations are:

- Have qualified test pilot or highly experienced pilot in the respective model aircraft at the controls.
- Apply contrasting colors grease pencil or chalk to the blade tips.
- Mechanic should consider direction of blade rotation and plan to position himself so that he is generally facing the direction of the blade tip path rotation. In the event of inadvertent loss of flag control, it will then be carried away from mechanic's body.
- Adjust flag to have midpoint of material at height of blade tip path at specified operational speeds and collective control paths.
- Get signal from pilot when ready to track.
- Approach helicopter with top of flag at ample outboard angle to insure against premature blade contact.
- Select resting point of flag staff at spot on the ground just outside of blade tip path and attain a comfortable stance.
- Hold flag material either in line with radius of rotation or slightly canted with direction of blade rotation to get better indications; avoid tearing material, and reduce possibility of loss of flag control with excessive engagement.
- Slowly and steadily move top of flag toward blade tips, pivoting about lower end resting on preselected point on the ground until contact is made with all blade tips. Attempt to get only one contact per blade to avoid conflicting marks.
- Withdraw flag and check marks.
- It is usually desirable, especially when tracking high rotors, to have a second man stationed some distance forward of and facing the man holding the flag to help judge and insure that the flag height is correct.
- Direction and extent of adjustment is usually available in the respective model maintenance directive.

Other methods of helicopter rotor blade tracking are:

(a) flag unit attached to pivot point on aircraft structure to accommodate extremely large models.

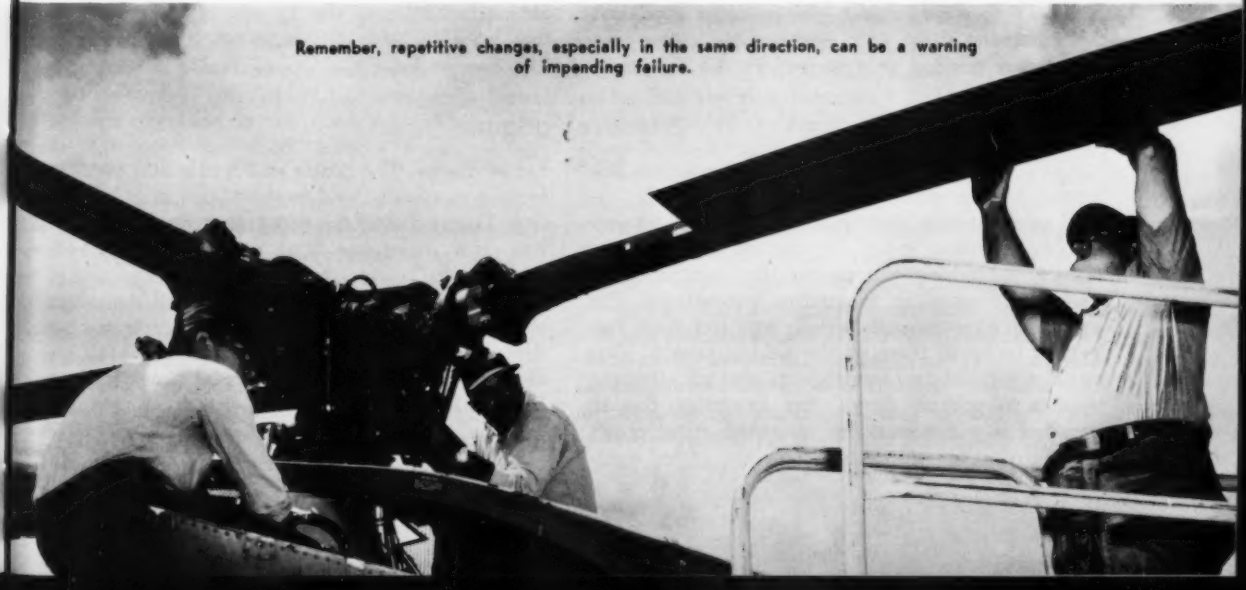
(b) a brush on the end of a pole to transfer marking substance to the lower blade (primarily suited for two-blade rotors).

(c) visual with experience (used on two-bladed rotors having contrasting color tips).

(d) electronic devices that convert light beam interruptions or capacitance variations into vertical height differential.

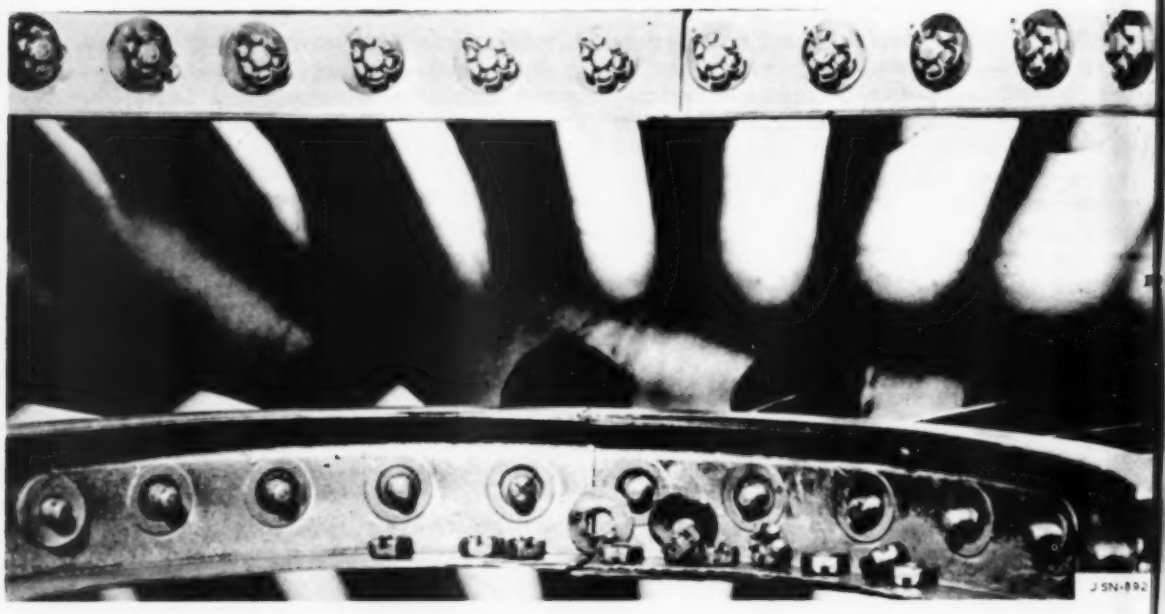
In the case of the light beam system, an indexing device must be secured to the rotor shaft to establish a reference blade. This is provided as a built-in feature on some models. Another feature provided on Kaman helicopters is inflight manual and automatic tracking systems which can also be used to facilitate initial ground track.

Tail rotor tracking may or may not be required depending on the model. Special procedures and devices are usually provided when tracking is required. Most of the aforementioned main rotor recommendations apply, especially those related with flag-to-blade tip contact. The requirement for use of caution is amplified by the higher tail rotor speeds and usually lower ground clearance.



Remember, repetitive changes, especially in the same direction, can be a warning of impending failure.

NOTES AND COMMENTS ON MAINTENANCE



Omitted Cotter Pins—Nuts Are Lost

In about 6.5 hours of operation, 11 out of 14 nuts securing the first-stage shroud in a J79-8A engine came off. The engine had been repaired for foreign object damage by replacing the compressor rotor and two first-stage stator vanes. In for *another case of FOD*, this condition was discovered.

One nut was in place and secured with a cotter pin, two nuts were in place with no cotter pins, and the remainder of the nuts, washers, and cotter pins were either missing or contained in the shroud as shown.

Because of the low time on this engine and the recent repairs in this area, one can safely suspect that the cotter pins were not installed as the final step in that part of the assembly. When you think about this, it's a real shame that so much equipment, money, and manhours were wasted because such an inexpensive item was apparently overlooked—all that work for only 6.5 hours of flight time.—*GE "Jet Service News"*

Pressure/Fatigue

REPETITIVE tasks of a hazardous nature following routine procedures are relatively safe unless complacency sets in. The time to expect trouble is when something out of the ordinary occurs; something not necessarily dangerous in itself but upsetting to routine procedures. For example, a go-around, wheels up, and then forgetting to lower them on the next approach. This out-of-the-ordinary routine-upsetting situation applies to ground crews, too. Diversion due to weather may overload and overwork ramp crews at an airport not set up to handle the added number of flights. The hustle and bustle and resulting fatigue can easily lead to oversights in good practice. This is the time a supervisor, tired as he may be, must make one final security check before signing off.

Even routine operations should be considered with cynicism. The visibility, ceiling, runway conditions, wind may be given correctly a high percentage of the time, but the few times they are in error leads to trouble.

FSF, Inc.

Familiarity Breeds Fatigue

FAMILIARITY and repetition lulled a tow operator into thinking he could handle a ground handling situation without assistance.

While towing an HU-16C from the AMD hangar area to the Air Operations parking ramp, the AD1, acting as a tow operator, attempted to place the aircraft between a parked HU-16C and a parked C-54P. This was attempted without the assistance of wing walkers. The starboard wing of the HU-16C passed under the starboard wing of the C-54P and made contact as shown in the photograph.

The tow operator realized what had happened, stopped the action and contacted the operations duty officer to report what had taken place.

Primary reason for this accident, in the board's opinion, was the disregarding of requirements for assisting personnel as wing walkers when handling the aircraft in a restricted area. A contributing factor was the misjudgment in regards to the two aircraft wing tips being able to clear one another. The tow operator knew the requirements for properly handling the aircraft prior to the subject collision but did not implement them.

The AD1 is considered a conscientious petty officer and has in many past situations displayed excellent safety traits, according to the board. His honesty in admitting his error in this situation should aid in the prevention of this type ground accident in the future.

Nameplate Ingestion Hazard

PREFLIGHTERS of an F-4 found the engine overhaul metal data plate bent and wedged at the secondary nozzle support ring. All four corners of the metal plate were torn out at the rivet holes. The rivets were still intact and tight in their mountings on the engine.

Apparently airloads and vibration had weakened the plate corners. If the plate had been loose or had fallen during ground or taxi operation or any period of reverse air flow the steel alloy data plate (4¾" x 2") could be sucked through the engine bellmouth opening and cause FOD.

Recommendations:

Operating activities: Inspect for security of engine overhaul data plates.

Overhaul activities: Overhaul data plates be installed using epoxy cement in addition to rivets.

Tool Check

AN S-2D had just completed the wing spread cycle and the pilot was in the process of conducting the "control free" check. During the aileron check it was not possible to rotate the yoke either left or right.

The engines were secured and an investigation commenced. A screwdriver was found lodged in the left aileron wing fold bellcrank in such a manner as to prevent any left or right aileron motion.

This type screwdriver was not utilized by the squadron. Markings indicate it belonged to O&R which had completed PAR on the aircraft about two weeks previously.

Thar She Blows!

AFTER replacement of the CSD generator unit in an F-4B, electricians of the night maintenance crew prepared to make a rear cockpit check with their test apparatus.

A flood lamp was strung to the rear cockpit from a power cart located near the inlet duct. The connection to the power cart was not secured properly, and upon run-up, the plug and wire were ingested by the engine. Sparks were seen coming out of the rear engine by the crash crew, a considerable distance away. The entire engine had to be replaced because of FOD.

Lost Tool

DURING climbout, following a touch-and-go landing, a 900 horsepower loss was experienced on the No. 1 engine of the P-3A.

After a normal landing, the aircraft was returned to the line and shut down.

Inspection of the engine disclosed a screwdriver blade in the compressor behind the first stage. The engine had endured multiple rotor and stator blade failures.

During maintenance on the engine or during a preflight/postflight inspection, a screwdriver had been left in the engine inlet duct. Eventually it had moved back into the compressor section.

Many squadrons have kept mishaps like this at a minimum by continually emphasizing Foreign Object Damage prevention in their training programs for maintenance and flight personnel.

Always account for all of your tools and hardware following maintenance of any kind.

Bookcase?

Here's a happening that was literally one-for-the-book (as the *USCG Flight Safety Bulletin* called it). On nearing its destination a transport had nose-gear trouble, but managed to land without mishap.

Inspectors found a maintenance manual in the nosewheel well! The condition of the book plus knowledge of the inclement weather prior to this particular flight's takeoff led the inspectors to believe that the manual was found on the ground and placed in the wheel well to protect it from the wind and rain . . . then forgotten!

Are mechanics now required to read so much that they are becoming absent-minded professors?

Candy Striping for FOD Control

A RECENT report indicates the painting of diagonal red stripes on FOD drums, barrels and other containers to attract would-be litterburgs' attention has been effective in FOD prevention and housekeeping efforts.—"*Whidbey Approach.*"

Foil FOD

A NUMBER of aviation safety publications have reprinted an Air National Guard do-it-yourself item dealing with modifying diagonal cutters. The mod calls for putting windshield sealing compound in the cavity of the jaws so that wire clippings will stick to the compound instead of disappearing into the bowels of a black box only to cause shorts in electrical circuits.

While the idea is a good one to prevent FOD of the type which has caused numerous electrical malfunctions, modified dykes are already in the naval supply general stores. Descriptive literature for these diagonals states "cushion throat prevents the cut-off pieces from flying away from the cutter and falling into inaccessible places."

Stock numbers are as follows:

4½" diagonal cutters GS 110-293-3209
7½" diagonal cutters GS 110-293-3210

Navy users of the store-bought cutters say these are superior to the homemade variety in that the cushion material is impervious to fuel, oil, grease and other liquids used in the maintenance of aircraft, thereby being more dependable as a FOD prevention tool.

Swench

A NEW, safe, fast and sure way of loosening frozen nuts, bolts, cap screws and spark plugs has been made possible through the use of a Swench—a manual impact wrench.

Early methods of using a sledge hammer and a long bar extension for these purposes is now outdated. Mechanics can save many man-hours, avoid injury to themselves and prevent damage to equipment by using a Swench.

The Swench is completely portable and requires no electrical power or air supply. Its use involves a one-man operation with little or no chance of rounding corners, slipping of the bar, missing the bar with a sledge hammer, falling off the work stand and the like. Where previous efforts to loosen shipping plugs in propeller shafts of reciprocating engines had taken up to five hours and even resorting to a drill and easy-out, plugs were removed with not more than three impacts with a Swench. A slight pull on the Swench handle advances it to 30 degrees where it releases a heavy duty spring with a heavy impact.

Model 625 is recommended for squadron level maintenance: Model 750 for O&R, Carrier and AMD level maintenance.

Federal Stock Numbers and data:

Model	*Description*	*Drive Size*	*Max Torque*	*FSN*
625	Swench	⅝"	500 ft lbs	5120-871-2592
750	Swench	¾"	800 ft lbs	5120-440-8047
PN 41-70680	Tubular Extension	⅝"	6" long	5120-878-2946
PN 41-70675	Tubular Extension	⅝"	10"	5120-878-2945
PN 41-70780	Tubular Extension	¾"	6"	5120-821-8935
PN 41-70775	Tubular Extension	¾"	12"	5120-821-8936

Microbial Fuel Tank Corrosion Resulting from Contaminated Jet Fuel

THE PROBLEM of microbial sludge in jet fuels has been under study for several years, and samples of contaminated jet fuel from various locations have been examined. The investigations of earlier and more recent years have shown that these microorganisms feed on hydrocarbons and produce slimes, mats of interwoven bacteria and fungi, residues, and solid emulsions.

The exact mechanisms involved in sludge and fuel tank corrosion are not completely understood at this time. However, several factors or combinations of factors seem to influence the severity of airplane operational problems. These are (1) water and water-soluble salts; (2) solid contaminants (particulate matter); (3) surfactants; (4) microorganisms; (5) temperature and environmental conditions; (6) airplane construction materials; treating methods, and coating materials; and (7) housekeeping of fuel-handling system.

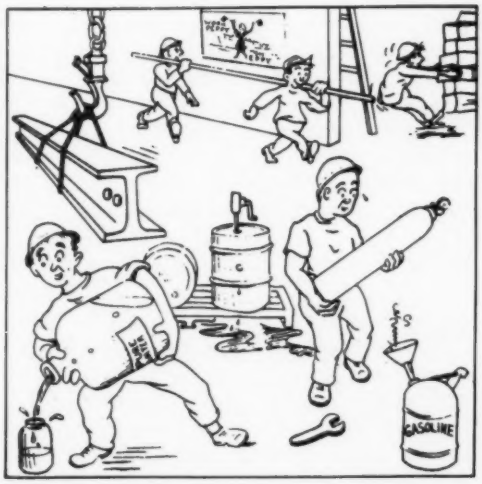
It has been known for a number of years that there are bacteria and fungi which survive in, and thrive on, jet fuel and fuel-and-water combinations. Through a program of analysis and isolation of the many types of organisms that make up the slime and sludge, it has been proved that they thrive and multiply readily in fuel and contaminated water combinations and show a preference for the long-chain hydrocarbons present in jet fuels. It is known also that the microorganisms are not only present in the slime and sludge; they actually cause it.

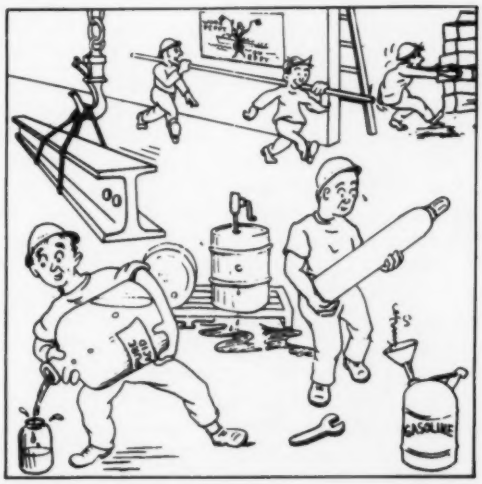
Fuel additives, incidentally, have not proved valuable in destroying the organisms, since they generally develop an immunity in a short time to any sort of antibiotics used in combating them.

Many environmental factors affect the growth of microorganisms in turbine fuel distribution systems and thereby influence airplane operational problems. Among these factors are increased fuel temperatures, a concentration of acidity or alkalinity and presence of nutritious salts in water bottoms, surfactant contamination, various fuel additives, and possibly polysulfide sealing and topcoating materials.

To prevent the possibility of organic growth and corrosion within the fuel tanks, it is recommended that the filters in the servicing units and the filters in the airplane fuel systems be replaced at the specified intervals. Also, the fuel drain sumps should be checked at the required time to prevent the accumulation of water.—*NAA Operation and Service News*

Six Differences





THESE drawings are based on a game called "Seven Differences" that originated in France a couple of years ago. In this case there are six differences in the drawings, each of which are accident causes. There are also 13 other hazards which are the same in both drawings. These don't count. The game is to *find the six differences.*

See page 44 for answers

FOD on the Flight Deck

FOD recently caused the loss of one T-58 SH-3A engine. During in-port periods FOD seems to accumulate rapidly, and in conjunction with in-port helicopter operations, it presents a serious hazard. Policing the flight deck prior to helicopter launches would reduce the FOD hazard.

In addition to the increased emphasis on indoctrination of personnel a series of notes in the Plan of the Day will be instigated. FOD cans have been placed on the hangar deck in strategic locations but the same procedure cannot be carried out on the flight deck.

Daily walkdowns of the flight deck, additional walkdowns if necessary and constant supervision by flight deck petty officers should keep the flight deck clear of FOD material.—*USS* INTREPID

Wet Blanket

AN A-4C was spotted for jet-cal aboard a carrier after a major check. The first attempt to start the aircraft ended in a wet start. After checking the scupper and drain lines the crew allowed the bird to sit for a half-hour before trying another start.

The second start ended with a fire in the tail section which was quickly put out without any damage to the aircraft. Because of a series of recent messages concerning fires in the scupper area this was uppermost in mind of the investigators. So, the tail pipe was pulled. Traces of carbon soot were along the sides of the metal and asbestos blanket.

After cleaning up the soot the plane was reassembled and another start was attempted. This time the power plants supervisor stuck his head in the after hell hole but had a CO_2 bottle handy. Again there was a flash and fire, not in the scupper but along the tailpipe itself. The fire was again quickly extinguished and the bird shut down.

The tailpipe was pulled again and the blanket removed. The smell of JP fuel was in the blanket. Mechanics then remembered stowing the tailpipe alongside the drop tank of the aircraft while it was undergoing check. During this period fuel had leaked from the drop tank pressure relief valve onto the tailpipe blanket.

The result: A crude kerosene lamp!—*Anymouse*

Shipping J57 Fuel Manifolds?

IF you are, take note. Use of incorrect shipping containers is causing the scrapping of a high percentage of J57 fuel manifolds. Damage is incurred during the shipping of the manifold from fleet activities to repair activities.

To prevent unnecessary damage and rejection of these high cost items operators should assure that fuel manifolds are correctly installed and supported in shipping container, PW Part No. 225954-B1 or like container prior to shipping it to repair activities.

Engine Trouble Warning

SPARK PLUG fouling is often due simply to low-power ground operations, but it pays to closely check all fouled plugs because fouling can be caused by severe engine trouble. The plug's condition usually can tell you what the trouble is.

For example, heavily fouled plugs can be a warning of piston failure. When pistons start to fail, they often cause small amounts of molten metal to spray onto the plug nose. These deposits frequently short out the plug and allow oil deposits to accumulate. So, if plugs are abnormally oil-fouled and show evidence of metal spray, be sure to check the combustion chamber for piston condition.

Fouled plugs also can alert you to the presence of small loose parts in the combustion chamber. Such parts bounce around and often travel from one cylinder to another through exhaust and intake ports. These objects can cause serious engine damage, and they often damage spark plug electrodes as well. If you find an oil-fouled plug with a damaged electrode, always check the combustion chamber for foreign objects. — *FSF*

Answer Clues to Six Differences, page 43

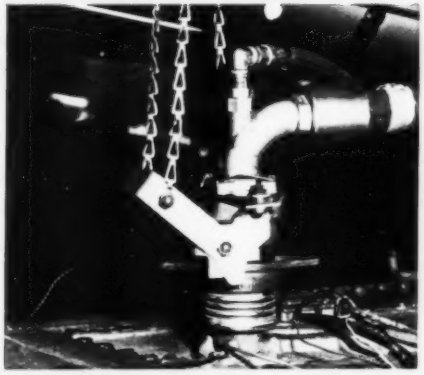
1. Ladder rung
2. Pipe and shoulder
3. Gas bottle
4. Man's Leg
5. Chain link
6. Acid, water

Other hazards in both drawings:

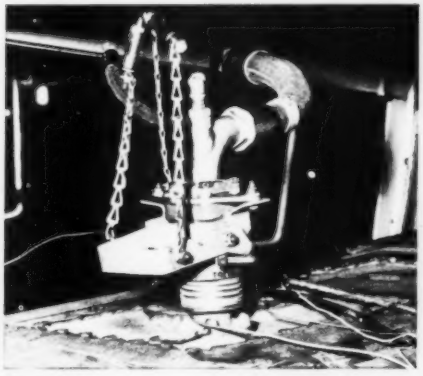
1. Open hook
2. Pouring wrong
3. Fluid on floor
4. Open gas can
5. No hard hat
6. Drum leak
7. Man under load
8. Drum not blocked
9. Wrench on deck
10. Carrying gas cylinder
11. Sling not cinched
12. No handle on gas can
13. Acid man has no face shield, gloves, etc.

—Courtesy of OIR "Safety Review"

MURPHY'S LAW *



Incorrect



Correct

P-2 Murphy

DURING flight an incident involving unintentional activation of the jettison system resulted in faulty operation of the fuel disconnect assembly on the starboard bomb-bay fuel transfer line.

After shackle release, the tank remained attached to the fuel transfer line and was suspended with the forward half of the tank hanging out of the bomb bay, making it impossible to close the bomb-bay doors. The center tank drain had parted above the check valve allowing unrestricted gravity flow of fuel from the starboard center tank into the bomb bay. By increasing airspeed to 200 knots and applying a 2-G pullup the pilot enabled the tank to tear away and drop into the sea. A successful landing was made with bomb-bay doors partially open.

Subsequent inspection and static testing of remaining squadron aircraft revealed four others in which the bracket (trapeze) assembly fuel disconnect did not cause the bomb-bay fuel transfer line to disconnect for one or more of the following reasons:

1. Murphy's Law. Misalignment by 90 degrees of the trapeze assembly with disconnect pivot flanges, photo, left.
2. Improper installation of fuel transfer hose assembly 751383-1.
3. Failure of the trapeze assembly to provide sufficient depression of disconnect flanges due to improper rigging of the trapeze chains and retaining chain between the fuel selector valve and disconnect fitting.
4. Homemade trapeze assemblies made of aluminum too weak for forces applied.
5. Corrosion of disconnect fittings.

It was noted that the Handbook of Maintenance Instructions does not supply sufficient information for proper installation or removal of the bracket assembly or proper connection of disconnect lines.

In view of possible consequences of unsuccessful jettisoning of the bomb-bay tank recommendations included:

a. Alert maintenance and flight crews of the possibility of Murphy installation and possibility of rotation of the disconnect pivot flanges resulting from inflight vibrations. This calls for close scrutiny of the whole assembly prior to each flight to insure proper alignment.

b. If installed, perform one-time functional drop tests of starboard bomb-bay tanks.

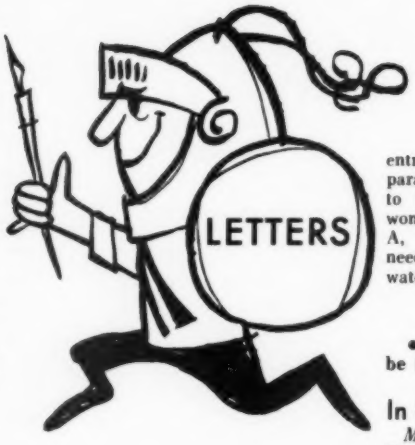
c. Perform functional drop test of starboard tanks after installation.

d. An engineering analysis be made on metals used and the criticality of chain lengths, general design instructions and procedures for installation of bomb-bay disconnects.

e. An airframes bulletin be issued authorizing removal of the adel clamp positioning the center tank drain line above the fuel pressure transmitter. This would prevent fuel leakage in the event of an unsuccessful jettisoning of the starboard bomb-bay tank.

Endorsers of the mishap report concurred in these recommendations.

* If an aircraft part can be installed incorrectly, someone will install it that way!



Pencil Flare Guns

Wellington, New Zealand—On page 23 of the February 1964 APPROACH there is a reference to a pencil flare gun in use by the U. S. naval aviator. So that the Royal New Zealand Air Force may equip with a pencil type flare gun, we would like to obtain further details of the current model as carried by USN aircrew, whether this be the BuWeps version or those commercially acquired.

Any assistance is this matter would be much appreciated.

D. M. DALLISON
SQUADRON LEADER
FLIGHT SAFETY OFFICER, RNZAF

• At the present writing, a BuWeps equipment release is being processed for the screw-on type Signal, Illumination Kit Mk 79 Mod O. It is the Bureau's intention to procure this design as a tri-service item. The approved model will be very similar to that shown in accompanying photograph with the addition of a tab on the bandolier and an extra feeder thread on the cartridges.

Comparison tests made by the Safety Center and observed by a representative of the Naval Ammunition Depot, Crane, Ind. showed the screw-on type signal preferable to the retracting sleeve type of quick-connect/disconnect signal. The test subject was a right-handed Navy pilot in high performance flight gear and a Mk5A anti-exposure suit. Tests were made both in and out of a one man raft in open water. The water temperature was 43° F., wind approximately 18 knots gusting to 25 knots and sea state 2 to 3.

It is suggested that you write Project Engineer J. Wildridge, NAD Crane, for technical information on the Mk 79 Mod O.

Two commercial manufacturers of similar items are Genrus Engineering Specialties, West Los Angeles, Calif., and Penguin Associates, Inc., Malvern, Pa.

Wrong Credit

Oklahoma City—I enjoyed the centerspread poem "The Last Bouquet" in the February 1965 issue of APPROACH. In fact, I have been trying to secure a copy of this poem since I lost my copy in 1948.

The credit for the poem rightly belongs to Gill Robb Wilson, former publisher of FLYING magazine.

FRANK L. REDDOUT
FLIGHT INSPECTOR
AERONAUTICAL CENTER

• Proper authorship is herewith acknowledged. We picked the poem out of the Grosse Ile flight schedule and mistakenly credited CDR John Lavra as the originator. Shortly after it appeared in APPROACH it was found in a 1952 Air Force Flying Safety magazine and we had an idea something was wrong.

Parachute Pockets

FPO, San Francisco—Thank you for February "Pocket Payoff." Clothing and Survival Equipment Change 5, Revision A will be a real asset in certain water landing situations. Do prospective parachutists still plan to adhere to the established procedure of unbuckling the parachute harness as outlined in NavWeps 00-80T-36 (page 3-15) in preparation for water entry? The hazard of abandoning the parachute too soon still presents itself to the inexperienced 'chutist, and I wonder if CSEB Change 5, Revision A, reduces or eliminates the urgent need to get out of the parachute upon water entry.

W. S. FORMAN, LT, USN
AIR ANTI-SUBMARINE SQUADRON 33

• As far as we know, there will be no change in procedure.

In the Book

Monterey, Calif.—On page 20 of the February issue was an Anymouse entitled "Flap Trap." As an ex-A-4 driver with 1250 hrs. in type I was somewhat intrigued by his problem so dug out my takeoff charts.

According to the data listed in the article and assuming he was at a field near sea level, the takeoff roll would be 6400 ft. In order to get the 4200 ft roll that the mouse expected, there would have had to been 35 kts of wind down the runway.

I suspect that instead of mispositioning the flaps, he forgot to add the weight of the shape in his gross weight when computing the takeoff roll. This is further supported by the fact that the charts show a 4200 foot takeoff roll for his aircraft under the conditions stated—except without the weight of the shape included.

C. K. COYNE, JR., LT
USNPGS, MONTEREY

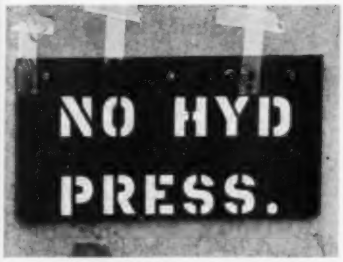
• Thank you for bringing this to our attention. NASC evaluates the situation the same as you do. Perhaps others can benefit from such an easy-to-make mistake as this.

Warning Signs

FPO, San Francisco—Often, while performing maintenance on an aircraft, it is mandatory that *no* electrical or hydraulic power be applied. Many different types of signs have been designed to warn maintenance personnel against applying power but they are usually of the hanging variety and end up falling off and becoming FOD potential.

Here's VF-213's approach to this problem. These signs are the same size and shape as the receptacle access doors on the F-4 and lock into the same airlock fasteners. Advantages to this design are:

• Positively preclude applying power



to aircraft until the sign is removed.

- Cover the receptacle and keep out foreign matter and moisture.
- Identifies the shop and person who installed the sign.
- Helps prevent the sign from becoming FOD.

These signs were designed for the F-4 but similar signs could be designed for other aircraft.

R. C. NICHOLSON
ASO, VF-213

New Ship

N. Y. Naval Shipyard—It is requested that the USS OGDEN (LPD-5) be placed on the automatic distribution list for APPROACH, the *U. S. Navy Aircraft Accident Statistics*, and the *Weekly Summary of Aircraft Accidents*.

USS OGDEN (LPD-5)
PROSPECTIVE CO

• You have been added—plus Crossfeed including Helicopter and Facilities portions.

Strength of Numbers

FPO New York—Re the "3M System" by LT C. M. Johns, I noted with interest the reference to the SecDef memorandum to SecNav wherein he stated that "the Navy's aircraft maintenance system compared unfavorably with that of the AF."

Many of us have worked with the AF system in connection with MATS, but I have never met a Navy AMO who felt that the AF system was superior to the Navy system established by BuWeps Inst 5440.2. Accordingly, I feel I must take exception to the quoted statement.

There must be figures available for a maintenance effort comparison and it would be nice for someone to come out publicly with facts and figures showing us where and how our maintenance effort has been second rate.

A. S. CREIDER, CDR

• Navy figures which were presented to SecDef led to the adoption of AF 66-1 in part and with modifications has become the Navy's 3-M system. The new maintenance data collection system should produce the intelligence you seek. At this point, comparison of Navy figures with AF figures would be like comparing apples with oranges since different "yardsticks" were employed.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Resuscitation

NAS Seattle—This unit has had considerable discussion on the subject of the best means of reviving a drowning victim. BuWeps Instruction 9920.1 of 3 March 1963, lists equipment to be carried on 40′ and 63′ AVRs. This list contains a resuscitator inhalator and a airway pharyngeal. My question is, which is the best method of reviving a drowned victim?

We have been informed that mouth-to-mouth resuscitation using the airway pharyngeal is better than using the resuscitator, because with the airway pharyngeal you can tell if the victim's throat is clear. However, with the resuscitator provided by BuWeps (which is an Emerson 2 FNO) this can also be determined by the automatic signaling device in the unit since it emits a rapid clicking if the victim's air passage is clogged. The Emerson 2 FNO also has the choice of selecting +13 —11 mm Hg or 27 mm Hg or 35 mm Hg which will increase the pressure going to the victim's lungs.

D. W CLOUSE, ABH1(AC)

• BuPers Training Manual (NavPers 10669) states in part: "Do not wait for a mechanical resuscitator, but when an approved model becomes available, use it." The Emerson 2 FNO is an approved resuscitator; therefore, your question has a fairly clear cut answer—use the mechanical resuscitator. If you should have more than one drowning victim or a malfunction of the resuscitator, it will be necessary to use the mouth-to-mouth method.

The important advantage of a good mechanical resuscitator is that it requires less skill to operate, is not fatiguing to the operator, and can supply 100% oxygen. The mechanical resuscitator can also be used as an aspirator to clear the airway of fluid and mucus. For further information about mechanical resuscitation, we would suggest that you read all of the section on this subject in NavPers 10669.

Your question was a good one and it is rewarding to know that you are giving such thought to first aid methods.

Superintendent of Documents
U. S. Government Printing Office
Washington, D. C. 20402

Please send APPROACH (NavWeps 00-75-510) for one year to the following address. Enclosed is a check or Money Order for $3.50. ($4.50 for foreign mailing)

Name .....

Address .....

City ..... State ..... Code .....

Vol 10 **approach** No 12

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

Contents

1 In the Long Run
By LCDR H. H. Williamson, Jr.

11 Free Ride

12 The Most Unforgettable Safety Officer I've Ever Known
By CDR D. M. Layton

14 Bread and Butter
By MAJ R. A. Bonney, USMC

16 Three-Engine Emergency Rate of Climb.
By LCDR Glenn M. Hayden

19 It Pays to Take Five!

24 Safe for Solo

26 Sea Trial

29 Last Minute Ejection

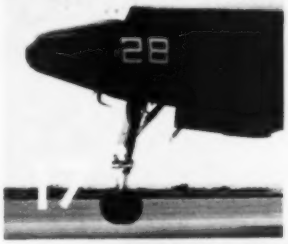
34 P-2 Bomb-Bay Tank Jettison

36 Helo Control Rigging
By Robert J. Meyer

48

DEPARTMENTS

8 Truth and Consequences
20 Anymouse
22 Headmouse
32 Flight Surgeons Notes
40 Maintenance Notes
45 Murphy's Law
46 Letters
IBC Lift and Drag



NavWeps 00-75-510

CREDITS

Cover painting of UH-2B to the rescue by C. MCDONOUGH, courtesy Kaman Aircraft Corp., Bloomfield, Conn.

Page 5—Diagram courtesy CDR HOMER C. ROSE

Page 16—Photo courtesy VU-1, NAS Barber's Point, Oahu, H.

Page 40—Photo courtesy General Electric JET SERVICE NEWS

Page 43—Art courtesy OIR SAFETY REVIEW

Purposes and policies: Approach, published monthly by the U. S. Naval Aviation Safety Center, is distributed to naval aeronautical organizations on the basis of 1 copy per 10 persons. It presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders, or directives. Material extracted from mishap reports may not be construed as incriminating under Art. 31, UCMJ. **Photos:** Official Navy or as credited. Non-naval activities are requested to contact NASC prior to reprinting Approach material. **Correspondence:** Contributions are welcome as are comments and criticisms. Views expressed in guest-written articles are not necessarily those of NASC. Requests for distribution changes should be directed to NASC, NAS, Norfolk, Va. 23511 Phone: Area Code 703, 444-3641 (days), 444-4331 (Nights, Weekends, Holidays) Att: Safety Education Dept., if you are receiving the magazine free because of military or commercial contract status with the Navy. . . . IF YOU ARE A PAID SUBSCRIBER, address all renewals and change of addresses to Superintendent of Documents, Washington, D. C. 20402. **Subscriptions:** Single copy 35 cents; 1-year subscriptions $3.50; 2 yrs., $7.00; 3 yrs., $10.50; $1.00 additional annually for foreign mailing. **Printing:** Issuance of this periodical approved in accordance with Department of the Navy Publications and Printing Regulations, NAVEXOS P-35. Library of Congress Catalog No. 57-60020.

RADM Paul D. Buie, Commander,

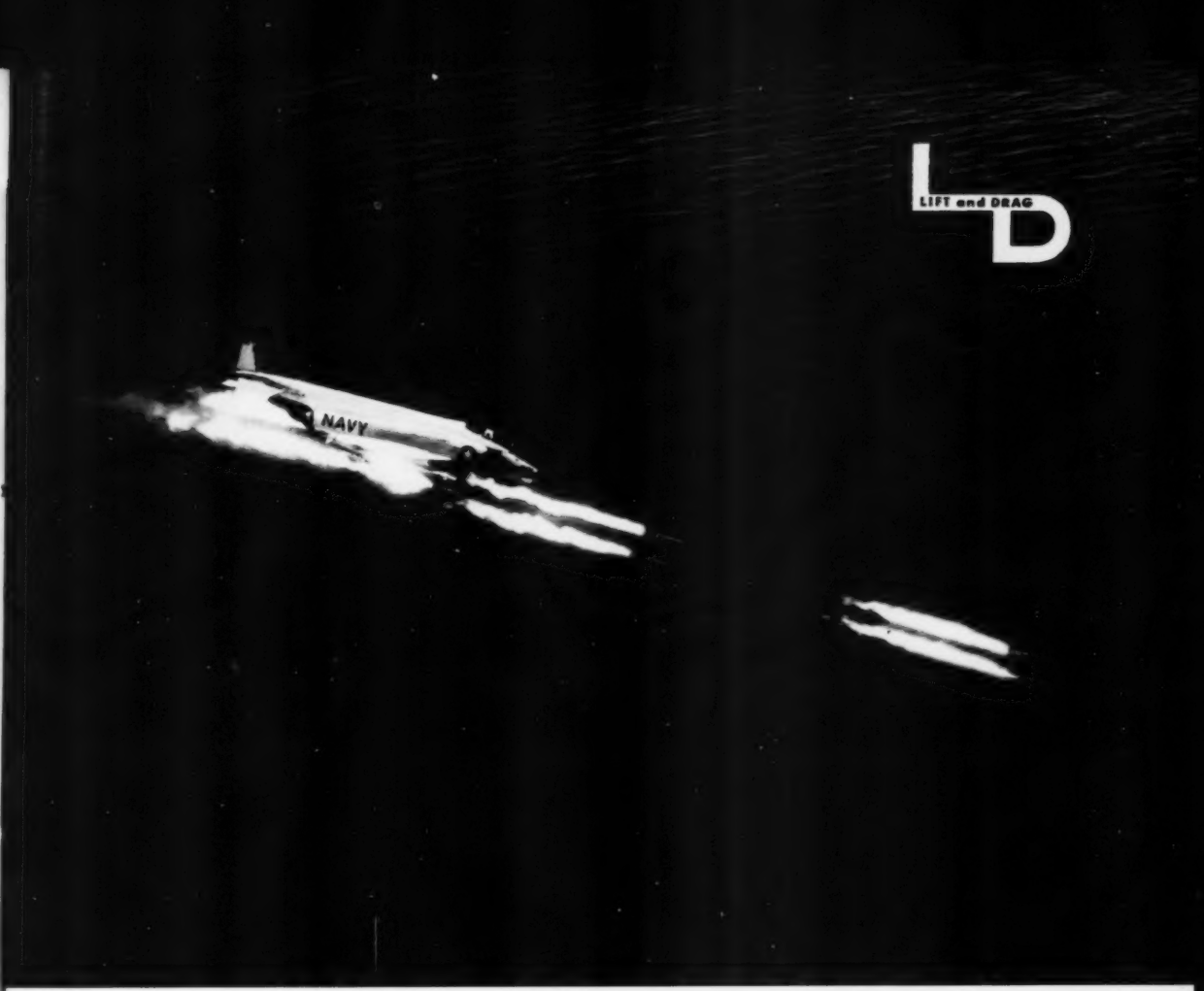
U. S. Naval Aviation Safety Cent

CDR Stephen Oliver, Head, Safety Education
A. Barrie Young, Jr., Editor
LCDR R. A. Wigent, Managing Editor
LT J. B. Pugh, Flight Operations Editor
J. T. LeBarron, Research/Ass't Flight Ops Editor
J. C. Kiriluk, Maintenance/Ass't Managing Editor
J. A. Bristow, Aviation Medicine/Survival Editor
Robert Trotter, Art Director
Blake Rader, Illustrator

N. A. Anderson, DMC, Production Control
Harry Culbertson, PH1 Photographer
F. W. Chapin, JO2, Editorial/Production Associate

Contributing Depts.

Accident Investigation, Head, LtCol W. L. Walker
Aero-Medical, Head, CAPT R. E. Luehrs, MC
Analysis and Research, Head, CDR D. A. Webster
Maintenance and Material, Head, LCDR R. A. Van Arsdol
Records and Statistics, Head, CDR R. L. Wollam



'The primary cause of the accident was the pilot's over-aggressive determination to complete the attack. While aggressiveness is a necessary part of a fighter pilot's tactics, it must be executed with sagacity gained through training and guidance from more experienced pilots within the squadron.'

From an AAR Endorsement

'GCA REPORTS THEY DO NOT HAVE YOU IN CONTACT...'

WHAT'S WRONG?

CHECK

ALTIMETER
You may be off ten thousand feet.

CHECK

NAVAID FREQUENCY or CHANNEL IDENTIFICATION
You may have tuned to the wrong station.

BASED ON TWO ACTUAL ACCIDENTS

TS
T
N

nd